NASA SP-7011(333)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 333)

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in January 1990 in

- *Scientific and Technical Aerospace Reports (STAR)*
- *International Aerospace Abstracts (IAA).*

National Aeronautics and Space Administration
Office of Management
Scientific and Technical Information Division
Washington, DC 1990

This supplement is available from the National Technical Information Service (NTIS), Springfield, Virginia 22161, price code A04.

INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* lists 122 reports, articles and other documents announced during January 1990 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA).* The first issue of the bibliography was published in July 1964.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the bibliography consists of a bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged by *STAR* categories 51 through 55, the Life Sciences division. The citations, and abstracts when available, are reproduced exactly as they appeared originally in *IAA* or *STAR,* including the original accession numbers from the respective announcement journals. The *IAA* items will precede the *STAR* items within each category.

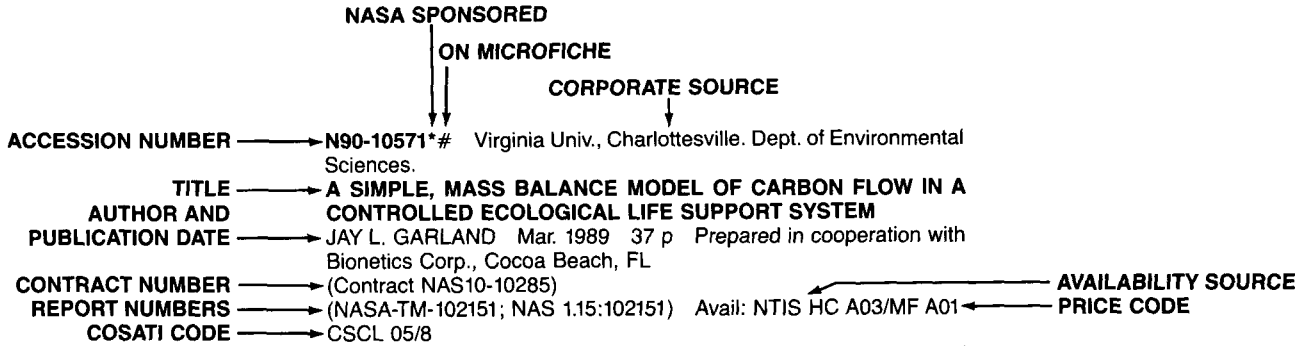
Seven indexes — subject, personal author, corporate source, foreign technology, contract, report number, and accession number — are included.

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1990 Supplements.

Information on the availability of cited publications including addresses of organizations and NTIS price schedules is located at the back of this bibliography.

TABLE OF CONTENTS

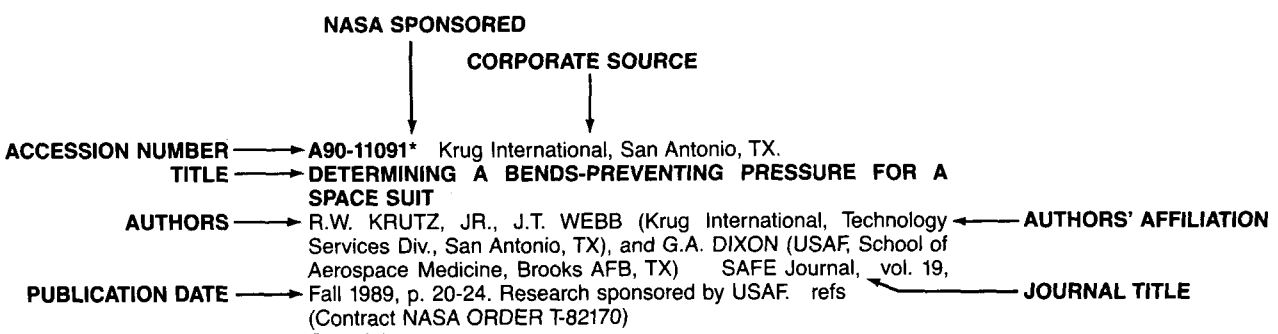
TYPICAL REPORT CITATION AND ABSTRACT



Internal cycling of chemical elements is a fundamental aspect of a Controlled Ecological Life Support System (CELSS). Mathematical models are useful tools for evaluating fluxes and reservoirs of elements associated with potential CELSS configurations. A simple mass balance model of carbon flow in CELSS was developed based on data from the CELSS Breadboard project at Kennedy Space Center. All carbon reservoirs and fluxes were calculated based on steady state conditions and modelled using linear, donor-controlled transfer coefficients. The linear expression of photosynthetic flux was replaced with Michaelis-Menten kinetics based on dynamical analysis of the model which found that the latter produced more adequate model output. Sensitivity analysis of the model indicated that accurate determination of the maximum rate of gross primary production is critical to the development of an accurate model of carbon flow. Atmospheric carbon dioxide was particularly sensitive to changes in photosynthetic rate. The small reservoir of CO2 relative to large CO2 fluxes increases the potential for volatility in CO2 concentration. Feedback control mechanisms regulating CO2 concentration will probably be necessary in a CELSS to reduce this system instability.

Author

TYPICAL JOURNAL ARTICLE CITATION AND ABSTRACT



Research conducted to determine the proper pressure for preventing bends during EVA without preoxygenation is examined. Male and female subjects with different breathing gas mixtures and pressures are studied in order to define the pressure. Visual and auditory Doppler ultrasonic signals are utilized to monitor intravascular gas bubbles. The workload, which simulates EVA, consists of a handturned bicycle ergometer, a torque wrench operation, and a rope pull. The experimental data reveal that the minimum space suit pressure needed to prevent decompression sickness is 9.5 psi.

I.F.

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 333)

FEBRUARY 1990

51

LIFE SCIENCES (GENERAL)

A90-10040* California Univ., Los Angeles.
EFFECTS OF PERIODIC WEIGHT SUPPORT ON MEDIAL GASTROCNEMIUS FIBERS OF SUSPENDED RATS
SCOT C. GRAHAM, ROLAND R. ROY, EDWARD O. HAUSCHKA, and V. REGGIE EDGERTON (California, University, Los Angeles) Journal of Applied Physiology (ISSN 0161-7567), vol. 67, Sept. 1989, p. 945-953. refs
(Contract NCA2-IR-390-502)
Copyright

The effects of seven-day-long hindlimb suspension (HS) and HS plus daily periodic weight support activity on the size and metabolic properties of individual fibers in the medial gastrocnemius (MG) of rats were examined. Sections of muscle tissue removed after seven day suspension were stained quantitatively for succinate dehydrogenase and alpha-glycerophosphate dehydrogenase, and qualitatively for myosin ATPase. It was found that short intermittent periods of weight support had a beneficial effect in maintaining the size and metabolic properties of both dark and light ATPase fibers in the deep regions (i.e., close to the bone) and of dark ATPase fibers in the superficial regions of the MG. The effect was greater in the deep regions. I.S.

A90-10950
EFFECT OF COLD ADAPTATION OF RATS IN ICE WATER ON THEIR RADIATION RESISTANCE [VLIIANIE ZAKALIVANIIA KRYS V LEDIANOI VODE NA IKH RADIOCHUVSTVITEL'NOST']
M. F. POPOVA, V. A. KAPRALOV, and I. V. SEMENOVA (AN SSSR, Institut Evoliutsionnoi Morfologii i Ekologii Zhivotnykh, Moscow, USSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 307, no. 4, 1989, p. 1010-1012. In Russian. refs
Copyright

Experimental results indicate that the short-term systematic immersion of rats in ice water over five weeks increase the radiation resistance of the epithelium of the small intestine. This is a manifestation of an increase in the overall nonspecific resistance of these animals to the effect of adverse factors, which include ionizing radiation. B.J.

A90-12349
RIBOSOMES, CRISTAE, AND THE PHYLOGENY OF LOWER EUKARYOTES [RIBOSOMY, KRISTY I FILOGENIIA NIZSHIKH EUKARIOT]
I. M. MIRABDULLAEV (AN USSR, Institut Zoologii i Parazitologii, Tashkent, Uzbek SSR) Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia (ISSN 0002-3329), Sept.-Oct. 1989, p. 689-700. In Russian. refs
Copyright

This paper proposes a phylogeny system for lower eukaryotes, based on correlations between the morphology of mitochondrial cristae (e.g., pipelike, crestlike, or discoid) and such cytological characteristics as the position of the phagocytosis zone, the type of mitosis, and the presence of a sex process, as well as evolutionary characteristics. According to this system, the lower eukaryotes of the Protista kingdom can be divided into six subkingdoms: Tubulicristata, Lamellicristata, Discocristata, Dinobionta, Archezoa, and Microsporobionta. I.S.

A90-12350
ROLE OF MICROFLORA AND ALGOFLORA IN ASSIMILATION OF VOLCANIC SUBSTRATES [ROL' MIKROFLORY I AL'GOFLORY V OSVOENII VULKANICHESKIKH SUBSTRATOV]
E. A. SHTINA (Kirovskii Sel'skokhoziaistvennyi Institut, Kirov, USSR) and T. I. KUZIAKINA (AN SSSR, Institut Vulkanologii, Petropavlovsk-Kamchatskii, USSR) Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia (ISSN 0002-3329), Sept.-Oct. 1989, p. 715-721. In Russian. refs
Copyright

The sequence of the development of microorganisms and algae on the ash and dross fields formed during the eruption of the Tiatia volcano (Kunashir Island, Kuril Islands) in July, 1973 was investigated using a wide variety of nutrient agars. Ashes collected during the eruption were sterile and, after cooling, were rapidly contaminated by airborne bacteria and actinomicetes. In August, the average number of micoorganisms per cu m of ash reached 518, with the type and the quantity of microorganisms depending upon the location of the ashes with respect to the crater and the type of vegetation that prevailed at the given location. On the other hand, endogenous microflora and algoflora were found to survive under the ashes at a depth of 110-120 cm. Forty species of algae were found, with a prevalence of unicellular green and yellow-green algae. The green-blue Mastigocladus laminosus Cohn. was encountered only at the crater border, where the temperature was between 50 and 70 C. I.S.

A90-12490
WEIGHTLESSNESS AND ELEMENTARY BIOLOGICAL PROCESSES [NEVESOMOST' I ELEMENTARNYE BIOLOGICHESKIE PROTSESSY]
GLEB P. PARFENOV Leningrad, Izdatel'stvo Nauka (Problemy Kosmicheskoi Biologii. Volume 57), 1988, 272 p. In Russian. refs
Copyright

Results are presented on studies of the effects of weightlessness on elementary processes in plant and animal cells and tissues, as well as viruses. These studies include biological experiments conducted aboard spacecraft, balloons, and rockets, as well as clinostat and centrifuge studies. Results show that, in unicellular organisms, the maximum cell size and basic morphology do not depend on gravity. Fungi were also found to retain all their properties except for gravitational ordering. Higher plants developed normally through seed-to-seed cycles, but changed their gravity-dependent movements; this change affected their final shape, but not their basic structure and size. The frequency of spontaneous and radiation-induced mutations changed insignificantly. The role of gravity in the development of the morphological, physiological, and genetic status of present-day organisms is discussed. I.S.

A90-12491
BIOLOGICAL EFFECTS OF LUNAR SOIL [BIOLOGICHESKIE EFFEKTY LUNNOGO GRUNTA]
VIKTOR V. KUSTOV, VIKTOR I. BELKIN, and GERMAN G. KRUGLIKOV Leningrad, Izdatel'stvo Nauka (Problemy Kosmicheskoi Biologii. Volume 61), 1989, 104 p. In Russian. refs
Copyright
This book describes biological effects of lunar soil, with particular attention given to results obtained in studies of the effects of samples collected by the Luna-16 probe on microbial and mammalian cells, as well as on the whole organs of experimental animals. Samples of lunar-soil powder introduced into the trachea of rats were found to cause pathological changes in the lung tissue, a decrease in oxygen consumption, and a decrease of body weight; inhalation of lunar soil also induced a decrease of blood hemoglobin and increases of blood catalase and peroxidase activities, relative to a terrestrial-soil analog. Samples obtained from the region of Mare Fecunditatis were found to be more pathogenic than those from a highland region of the moon. I.S.

A90-12492
BIORHYTHM INVESTIGATIONS IN SPACE BIOLOGY AND MEDICINE [BIORITMOLOGICHESKIE ISSLEDOVANIIA V KOSMICHESKOI BIOLOGII I MEDITSINE]
O. G. GAZENKO, ED. Moscow, Izdatel'stvo Nauka (Problemy Kosmicheskoi Biologii. Volume 64), 1989, 200 p. In Russian. No individual items are abstracted in this volume.
Copyright
Results are presented on the effects of weightlessness on biorhythms, with particular attention given to studies on animal adaptation to the conditions of space flight. Papers are presented on the circadian rhythms of the parameters of the human cardiorespiratory system, the effects of a two-shift schedule on biorhythms, the circadian rhythm of body temperature in humans subjected to clinostatic hypokinesia, fluctuations in the external respiratory system of humans during passive orthostasis, and the relationship between circadian and minute rhythms in rats after a flight aboard the Cosmos 1129 biosatellite. Attention is also given to the effect of weightlessness on the minute rhythms of sensorimotor functions of monkeys, fluctuations of thyroidal hormones in rats, the effect of fasting initiated at different times of a day on the circadian rhythms of lipid contents in the bone marrow and thymus of rats, multiple-day metabolic rhythms in rats, and the physiological correlates of flight load. I.S.

A90-12671
RNA EDITING IN WHEAT MITOCHONDRIA RESULTS IN THE CONSERVATION OF PROTEIN SEQUENCES
JOSE M. GUALBERTO, LORENZO LAMATTINA, GERALDINE BONNARD, JACQUES-HENRY WEIL, and JEAN-MICHEL GRIENENBERGER (CNRS, Institut de Biologie Moleculaire des Plantes, Strasbourg, France) Nature (ISSN 0028-0836), vol. 341, Oct. 19, 1989, p. 660-662. Research supported by the Ministry of Education of Portugal. refs
Copyright
It is reported here that RNA editing is required for the correct expression of plant mitochondrial genes. Wheat mitochondrial gene sequences containing C residues have been found that are edited to U residues in the corresponding mRNA sequences. In this way, CGG codons can be changed to UGG codons in the mRNA so that tryptophan may be encoded according to the universal genetic code. For each codon modification resulting from a C - U conversion that was studied, a corresponding change in the amino acid that was encoded was found. RNA editing in wheat mitochondria can thus maintain genetic information at the RNA level and as a result contribute to the conservation of mitochondrial protein sequences among plants. C.D.

A90-12672
RNA EDITING IN PLANT MITOCHONDRIA
PATRICK S. COVELLO and MICHAEL W. GRAY (Dalhousie University, Halifax, Canada) Nature (ISSN 0028-0836), vol. 341, Oct. 19, 1989, p. 662-666. Research supported by the Medical Research Council of Canada. refs
Copyright
An RNA editing phenomenon is reported that involves the conversion of cytidine to uridine at multiple positions in the mRNA for subunit II of cytochrome c oxidase in wheat mitochondria. Such RNA editing provides an explanation for apparent coding anomalies in plant mitochondria. C.D.

N90-10519# California Univ., Irvine. Laser Inst. and Medical Clinic.
BIOMEDICAL STUDIES WITH THE FREE ELECTRON LASER Final Report, 1 Feb. 1986 - 31 Jan. 1988
MICHAEL W. BERNS 15 May 1989 215 p
(Contract N00014-86-K-0115)
(AD-A208927) Avail: NTIS HC A10/MF A01 CSCL 06/7
An electrostatic VandeGraff free electron laser (FEL) was used to study the effects of infrared radiation on the synthesis of DNA and RNA in living vertebrate cells in culture. The laser was operated at wavelengths of 165 and 200 microns at power densities of 0.1 to 30 KW/sq cm. Cells were incubated in radioactive precursors to either DNA or RNA following exposure to the FEL and analyzed by light microscope autoradiography. The results indicated that the 200 micron wavelength inhibited DNA but not RNA synthesis in a subpopulation of cells and the 165 micron wavelength inhibited RNA synthesis and not DNA synthesis. The statistical significance for the 200 micron wavelength studies was $p = 0.05$ and for the 165 micron wavelength studies $p = 0.001$ to 0.005. GRA

N90-10520# Massachusetts Inst. of Tech., Cambridge. Div. of Health Sciences and Technology.
ELECTROPORATION: THEORY OF BASIC MECHANISMS Annual Project Report, 1 Jun. 1988 - 31 May 1989
JAMES C. WEAVER 30 Jun. 1989 52 p
(Contract N00014-87-K-0497; RR04108)
(AD-A210196) Avail: NTIS HC A04/MF A01 CSCL 06/1
Electroporation is a dramatic and apparently universal phenomenon which occurs in all bilayer-containing membranes. For this reason electroporation has implications for basic understanding of cell membranes, and is also likely to lead to a number of new applications. A quantitative understanding of how electroporation occurs has been lacking. We report significant progress towards providing descriptions of mechanisms which can quantitatively account for most of the complex electrical behavior of planar bilayer membranes without proteins. This has set the stage for development of models which describe both electrical behavior and molecular transport. In summary form, electroporation is now believed to be a universal cell membrane phenomenon, involving both the lipid bilayer and membrane macromolecules, and is therefore fundamental to membrane understanding, and it provides a general method for introducing molecules into cells, or releasing molecules from cells, with potentially major applications in science and technology. GRA

N90-10521# SRI International Corp., Menlo Park, CA. Dept. of Molecular Biology.
GENETIC ENGINEERING OF SINGLE-DOMAIN MAGNETIC PARTICLES Progress Report, 1 Mar. - 15 Jun. 1989
NAHID S. WALEH 15 Jun. 1989 5 p
(Contract N00014-89-C-0085; RR04106)
(AD-A210332) Avail: NTIS HC A02/MF A01 CSCL 06/13
Magnetotactic bacteria selectively synthesize membrane-bound, nanometer-sized, single-domain magnetic particles known as magnetosomes. Because these bacteria have complex nutritional requirements, only one species, Aquaspirillum magnetotacticum has been grown in pure culture. This bacterium produces approximately twenty intracellular magnetic particles per cell of single-domain size. To synthesize these particles, A. magnetotacticum must possess a highly efficient system(s) to remove iron from the environment. To investigate the mechanism of iron-uptake and the synthesis of magnetic particles in this microorganism, we will construct and screen genomic libraries of A. magnetotacticum for the iron-uptake and magnetosome-

synthesizing genes. We will also use the available information on the mechanisms of iron-uptake in other bacteria to identify and characterize analogous systems, related genes, or homologous sequences in this magnetotactic bacterium. We have determined already that the genes of A. magnetotacticum are functionally expressed in E. coli. Furthermore, we have identified in this bacterium a sequence homologous to the tonB gene of E. coli. The tonB gene is known to be required for iron assimilation in enteric bacteria. The long-term goal of this project is to clone the identified genes in suitable host organisms that would make the large-scale, regulated production of single-domain magnetic particles possible. GRA

N90-10522# Oklahoma Univ., Norman. Dept. of Botany and Microbiology.
MOLECULAR BIOLOGY AND PHYSIOLOGY OF METHANOGENIC ARCHAEBACTERIA Annual Report, Jul. 1988 - Jun. 1989
DAVID P. NAGLE, JR., DAVID R. MCCARTHY, and RALPH S. TANNER 27 Jun. 1989 17 p
(Contract N00014-86-K-0222; RR04106)
(AD-A210399; REPT-89-00014-01) Avail: NTIS HC A03/MF A01 CSCL 06/13

Methane-producing archaebacteria are worthy of their novel biology and potential in anaerobic bioprocessing. The biochemistry, genetics, and molecular biology of the thermophilic autotroph Methanobacterium thermoautotrophicum are studied. DNA from antimetabolite resistant mutant strains was used to transform sensitive recipient cells to resistance, and DNA was cloned into Escherichia coli plasmids. This DNA will be mutated with transposons in the E. coli host, then isolated and used to transform methanogen cells to selectable mutant phenotypes. Mutant strains resistant to purine analogs were used to determine that wild type cells of M. thermoautotrophicum possess an almost complete set of enzymes for uptake, activation, and interconversion of purine bases and nucleosides. These mutants and the information about the pathways will be the basis for generating a genetic map. Metabolic studies of a unique formate auxotroph revealed a new role for this one carbon compound in the anabolic metabolism of this methanogen. GRA

N90-11437# Department of Energy, Washington, DC. Office of Health and Environmental Research.
DOE/CEC WORKSHOP ON CRITICAL EVALUATION OF RADIOBIOLOGICAL DATA TO BIOPHYSICAL MODELING
1988 47 p Presented at the DOE/CEC Workshop, Oak Ridge, TN, 22-24 Jun. 1988 Prepared in cooperation with Commission of the European Communities, Brussels (Belgium)
(DE89-015214; CONF-8806237) Avail: NTIS HC A03/MF A01

The Department of Energy's Office of Health and Environmental Research and the Commission of the European Communities (CEC) Radiation Protection Program support the majority of research in the field of radiobiological modeling. This field of science develops models based on scientifically sound principles to predict biological response (at the cellular, molecular, and animal level) to exposure to low level ionizing radiation. Biophysical models are an important tool for estimating response of ionizing radiation at low doses and dose rates. Generally speaking, the biophysical models can be classified into two groups: (1) mechanistic models, and (2) phenomenological models. Mechanistic models are based on some assumptions about the physical, chemical, or biological mechanisms of action in association with radiobiological data whereas the phenomenological models are based solely on available experimental data on radiobiological effects with less emphasis on mechanisms of action. There are a number of these models which are being developed. Since model builders rely on radiobiological data available in the literature either to develop mechanistic or phenomenological models, it is essential that a critical evaluation of existing radiobiological data be made and data that is generally considered good and most appropriate for biophysical modeling be identified. DOE

N90-11438# Southwest Research Inst., San Antonio, TX.
STUDY OF THE BEHAVIORAL AND BIOLOGICAL EFFECTS OF HIGH INTENSITY 60 HZ ELECTRIC FIELDS Quarterly Progress Report No. 29
JOHN L. ORR 14 Jul. 1989 141 p
(Contract DE-AC02-80RA-50219)
(DE89-015528; DOE/RA-50219/T9; SWRI-12-6253) Avail: NTIS HC A07/MF A01

Activities this quarter involved all phases of the project plus a meeting of the Joint Committee in Tokyo. Detailed mapping of the exposure facility is scheduled to be completed during the week of August 14, 1989. Both electric and magnetic fields should be available for tests of the components of the tether and blood sampling system for the neuroendocrine pilot study in September 1989. The groups for the social behavior study are stabilizing appropriately. Details on the formation of the groups and their status was provided. Information was included related to aspects of the social experiment ranging from age estimation in baboons through the cardiovascular consequences of psychosocial stress. In addition, a draft manuscript is included on the data from the previous experiments which describes the effects of 30 and 60 kV/m electric fields on the social behavior of baboons. Tests of the blood handling procedures and analysis methods were completed. With the exception of the catecholamine analyses, the handling procedures and variability in replicate measurements are satisfactory. Logistic and practical considerations now weigh strongly against including the analysis of the blood samples for catecholamines. Preliminary tests indicate that a sampling procedure which will work for the other compounds is probably not satisfactory for the catecholamines. DOE

52

AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

A90-10041
SYMPATHETIC NERVE ACTIVITY RELATED TO LOCAL FATIGUE SENSATION DURING STATIC CONTRACTION
MITSURU SAITO, TADAAKI MANO (Nagoya University, Japan), and SATOSHI IWASE (Toyota Technological Institute, Nagoya, Japan) Journal of Applied Physiology (ISSN 0161-7567), vol. 67, Sept. 1989, p. 980-984. refs
Copyright

The relationship between the level of subjective fatigue sensation in active muscle and the measure of muscle sympathetic nerve activity (MSNA) during static muscle contractions exerted with maximal effort was investigated in human subjects undergoing static exercise. The MSNA was recorded by microneurography; the levels of fatigue sensation (LFSs) in working muscles were estimated, on the scale of 0 to 10, during static handgrip (SHG), exerted at a tension of 25 percent of maximal voluntary contraction until the given tension could no longer be sustained. The correlation found between LFS and MSNA was statistically significant, indicating that the response of the muscle sympathetic nerves to SHG is directly related to the psychological feelings of fatigue in the working muscles. I.S.

A90-10042* California Univ., San Francisco.
DETERMINANTS OF BONE DENSITY AMONG ATHLETES ENGAGED IN WEIGHT-BEARING AND NON-WEIGHT-BEARING ACTIVITY
JON E. BLOCK, ANNE L. FRIEDLANDER, GEORGE A. BROOKS, PETER STEIGER, HARRISON A. STUBBS (California, University, San Francisco and Berkeley) et al. Journal of Applied Physiology (ISSN 0161-7567), vol. 67, Sept. 1989, p. 1100-1105. Research supported by NASA. refs

(Contract NIH-AR-37562)

The effect of weight bearing activity on the bone density was investigated in athletes by comparing the measures of bone density of athletes engaged in weight-training programs with those of polo players and nonexercising subjects. All subjects had measurements of spinal trabecular and integral bone density by quantitative tomography, as well as determinations of hip bone density by dual photon absorptiometry. Results confirmed previous findings by Block et al. (1987) of significantly greater bone density among highly trained athletes compared with nonexercising subjects of similar age. Results also indicated that athletes engaged in non-weight-bearing forms of rigorous exercise had greater levels of bone density. However, as the participants in this study were exceptional athletes, engaged in a strenuous sport with both aerobic and heavy resistance components, a confirmation of these data is needed, using larger samples of individuals. I.S.

A90-10043
AMINOPHYLLINE EFFECTS ON VENTILATORY RESPONSE TO HYPOXIA AND HYPEROXIA IN NORMAL ADULTS

D. GEORGOPOULOS, S. G. HOLTBY, D. BEREZANSKI, and N. R. ANTHONISEN (Manitoba, University, Winnipeg, Canada)
Journal of Applied Physiology (ISSN 0161-7567), vol. 67, Sept. 1989, p. 1150-1156. Research supported by the Medical Research Council of Canada. refs

The effect of aminophylline, an adenosine blocker, on the ventilatory response to isocapnic hypoxia and hyperoxia in humans was investigated. Ventilation was evaluated with and without pretreatment with aminophylline while the subjects breathed pure O2 after either breathing room air or after 25 min of isocapnic hypoxia (80 percent arterial O2 saturation). Results showed that, both with and without aminophylline, 5 min of hyperoxia increased the inspiratory minute ventilation, V(I), significantly from normoxic base line. In control experiments, with hypoxia, the values of V(I) initially increased and then decreased to levels that were slightly above the normoxic base line. Pretreatment with aminophylline was found to significantly attenuate the hypoxic ventilatory decline. However, aminophylline did not prevent steady-state hyperoxic hyperventilation, as would have been the case if the response was related to adenosine. I.S.

A90-10044
INCREASED CHEMORECEPTOR OUTPUT AND VENTILATORY RESPONSE TO SUSTAINED HYPOXIA

D. GEORGOPOULOS, S. WALKER, and N. R. ANTHONISEN (Manitoba, University, Winnipeg, Canada) Journal of Applied Physiology (ISSN 0161-7567), vol. 67, Sept. 1989, p. 1157-1163. Research supported by the Medical Research Council of Canada. refs

The effect of selective stimulation of peripheral chemoreceptors (PCs) on the ventilatory response pattern to hypoxia was investigated by studying the ventilatory response to sustained isocapnic hypoxia, VRSH, (25 min, 80 percent arterial O2 saturation) in humans, with and without pretreatment of subjects with almitrine. In addition, central respiratory drive was evaluated before and at the end of hypoxic exposure, using a step increase of inspired O2 concentration thought to 'turn off' PCs. Results indicated that, in normal adults, chemoreceptor discharge is an important factor in the generation of the biphasic response pattern by hypoxia. Stimulation of the PCs with almitrine significantly modified the ventilatory response to sustained hypoxia; in the almitrine-treated subjects, the initial hypoxic ventilatory increase and the subsequent decline were significantly higher than those observed in control subjects. I.S.

A90-10242
THE EFFECTS OF NUTRITIONAL CORRECTORS ON BIOCHEMICAL, IMMUNOLOGICAL, AND WORK CAPACITY INDICATORS OF A FLIGHT CREW UNDER THE CONDITIONS OF A 3-WEEK FITNESS TRAINING CAMP [WPLYW KOREKTOROW ZYWIENIOWYCH NA WSKAZNIKI BIOCHEMICZNE, IMMUNOGICZNE ORAZ WYDOLNOSC FIZYCZNA PERSONELU LATAJACEGO W WARUNKACH 3-TYGODNIOWEGO OBOZU KONDYCYJNEGO]

H. MALEWICZ, S. BARANSKI, M. S. BELAKOVSKII, A. S. USHAKOV, and A. N. KOCHETKOVA Postepy Astronautyki (ISSN 0373-5982), vol. 22, no. 1-2, 1989, p. 15-28. In Polish. refs

Flight crew members in a specialized training program were administered two nutritional correctors and a set of amino acids. Consideration is given to the effects of the nutritional correctors on the reactivity of biological systems during strenuous physical activity. The results suggest that the nutritional correctors may be used to control the reaction of biological systems and to increase human adaptation to exercise conditions. R.B.

A90-10243
THE RELATION BETWEEN THE LEVELS OF FREE FATTY ACIDS AND CORTISOL IN BLOOD SERUM AND +GZ ACCELERATION TOLERANCE [ZALEZNOSC POZIOMU WOLNYCH KWASOW TLUSZCZOWYCH I KORTYZOLU W SUROWICY KRWI U LUDZI OD STOPNIA TOLERANCJI PRZYSPIESZENIA +GZ]

DANUTA GEMBICKA, MIECZYSLAW WOJTKOWIAK, and WLADYSLAW SWIECICKI (Wojskowy Instytut Medycyny Lotniczej, Warsaw, Poland) Postepy Astronautyki (ISSN 0373-5982), vol. 22, no. 1-2, 1989, p. 29-36. In Polish. refs

The relation between levels of +Gz acceleration and the levels of free fatty acids and cortisol in blood serum after +Gz exposures is examined. A group of 65 clinically healthy men between the ages of 19 and 22 were examined on a human centrifuge, using linearly increasing 0.1 G/s acceleration. Blood samples from before and after exposure to acceleration were compared. A positive correlation was found between the levels of exposure to +Gz acceleration and increases in the levels of free fatty acids in blood serum. The results suggest that people who tolerate higher levels of acceleration have more intensive mobilization of free fatty acids into the blood. R.B.

A90-10246
TOLERANCE TO ACUTE HYPOXIA AS RELATED TO PHYSICAL EFFICIENCY [TOLERANCJA OSTREGO NIEDOTLENIENIA W ZALEZNOSCI OO WYDOLNOSCI FIZYCZNEJ]

LUCJAN GOLEC and LECH MARKIEWICZ (Wojskowy Instytut Medycyny Lotniczej, Warsaw, Poland) Postepy Astronautyki (ISSN 0373-5982), vol. 22, no. 1-2, 1989, p. 55-61. In Polish. refs

In order to describe the relation between physical efficiency and resistability to acute altitude hypoxia, 130 cadets were subjected to examination. Physical efficiency was evaluated using the indirect method, based on the value of VO2max. For determining the reserve time, a nitrogen-oxygen gaseous mixture was used. A relation was found between physical efficiency, evaluated on the premises of VO2max, and the reserve time, determined with application of a low-oxygen gaseous mixture.
Author

A90-10247
EFFECTS OF A SINGLE DOSE OF ACETAMINOPHEN ON THE SELECTIVITY OF ATTENTION IN PILOTS [WPLYW JEDNORAZOWEJ DAWKI ACETAMINOPHENU NA PODZIELNOSC UWAGI U PILOTOW]

WLADYSLAW SWIECICKI, JAN TERELAK (Wojskowy Instytut Medycyny Lotniczej, Warsaw, Poland), and EUGENIUSZ MARKS Postepy Astronautyki (ISSN 0373-5982), vol. 22, no. 1-2, 1989, p.

63-67. In Polish. refs
Copyright

The effect of acetaminophen administered in a single dose upon the selectivity of pilot attention is examined. The subjects were 10 military pilots, age 21-49. The psychological examination was carried out twice: two days before and one hour after the drug administration. The administered drug was found to have a negative effect on attention divisibility in the pilots. Author

A90-10249
SELECTED PHYSICAL TRAINING EXERCISES FOR PILOTS AFFECTING THE CARDIOVASCULAR SYSTEM AND LEADING TO INCREASED ACCELERATION TOLERANCE [WYBRANE CWICZENIA FIZYCZNE PRZYGOTOWUJACE PILOTOW DO WYKONYWANIA PROB KRAZENIOWO-ODDECHOWYCH ZWIEKSZAJACYCH TOLERANCJE PRZYSPIESZENIA]
MIECZYSLAW WOJTKOWIAK (Wojskowy Instytut Medycyny Lotniczej, Warsaw, Poland) Postepy Astronautyki (ISSN 0373-5982), vol. 22, no. 1-2, 1989, p. 83-94. In Polish. refs
Copyright

During centrifuge initial selection, 85 subjects were identified who did not reach the acceleration tolerance limits for pilots and pilot-candidates, i.e., +5.7 Gz. In order to improve this tolerance, physical training was applied, including isometric muscular system training and breathing exercises. Six weeks of training significantly increased acceleration tolerance in 94 percent of the subjects, by 1.44 G. It is recommended that this training should be introduced into routine programs of physical training for pilots. Author

A90-10257
INFLUENCE OF CLOTHING AND BODY-FAT INSULATION ON THERMAL ADJUSTMENTS TO COLD-WATER STRESS
MICHAEL M. TONER, WILLIAM L. HOLDEN, MICHAEL E. FOLEY, JAMES E. BOGART, and KENT B. PANDOLF (U.S. Army, Research Institute of Environmental Medicine, Natick, MA; Queens College, Flushing, NY) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 60, Oct. 1989, Section I, p. 957-963. refs
Copyright

The effects of body-fat and external insulation (clothing) on the thermal responses of humans during adjustment to cold-water stress (3-hr-long immersion in 10 C or 15 C water) were investigated. Male subjects were divided into a low body-fat (L) and a moderate body-fat (M) group; each was dressed either in a dry suit plus a medium-insulation undergarment (DS-M) or a dry suit plus heavy insulation (DS-H). The responses obtained for 10-C and 15-C water immersions at hour-3 were similar. For 10-C immersion, rectal temperature was only slightly higher in M (DS-M = 36.4 C; DS-H = 36.5 C) than in the L group (DS-M = 35.9 C; DS-H = 36.3 C), whereas mean skin temperature and metabolic rate were, in general, slightly lower for M body-fat group (DS-M = 23.6 C, 184 W; DS-H = 25.5 C, 147 W, respectively) than for L (DS-M = 24.6 C, 194 W; DS-H = 26.2 C, 197 W, respectively). Results suggest that, despite the variation in body fatness, minimal thermal differences between groups were noted because of the attenuating effects of the insulated clothing. I.S.

A90-10258
EXPERIMENTAL HYPOTHERMIA AND COLD PERCEPTION
RICHARD G. HOFFMAN and ROBERT S. POZOS (Minnesota, University, Duluth) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 60, Oct. 1989, Section I, p. 964-969. Research supported by Stearns Corp. refs
(Contract N00014-88-K-0582; DAMD17-88-C-8054)
Copyright

Twelve subjects clothed in flotation suits were immersed in 10 C cold water and their surface temperatures at the back and groin, as well as core temperatures, were continuously monitored. Subjects were unable to reliably assess how cold they were, with the highest correlation observed between perceived temperature and actual temperature reaching only 0.51. This was felt to be partially due to the uneven distribution of surface temperatures seen in this experiment and in most cold water immersions. Rapid cooling in cold water also produced the perceptual phenomenon of 'overshooting' previously observed in cold air studies, characterized by sudden temperature drops being perceived as cold sensations of greater magnitude. The results suggest that subjects who are rapidly cooled in water may have considerably difficulty separating feelings of cold from feelings of pain and discomfort, which can have serious implications in survival situations and highlights the subjective and highly variable nature of cold perception. Perceived cold sensation may be a very poor, and possibly dangerous, predictor in cold water immersion situations. Author

A90-10259
TWO CASE REPORTS OF BACTERIAL PROSTATITIS WITH A PROPOSED TREATMENT FOR AVIATORS
GARRETT R. TUCKER, III (USAF, School of Aerospace Medicine, Brooks AFB, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 60, Oct. 1989, Section I, p. 983-989. refs
Copyright

Bacterial prostatitis is the inflammation of the prostate gland secondary to a bacteria infection, characteristically having a chronic course with sporadic acute exacerbations. While considered to be the most common cause of recurrent bacterial urinary tract infections in the middle-aged adult male, bacterial prostatitis can be difficult to manage satisfactorily, particularly from the aeromedical perspective. The recurrent infection pattern, common for chronic bacterial prostatitis, has recently been better defined with the localization of the bacterial reservoir as being within the lumen of the prostatic ducts. Capitalizing on 'passive ion trapping' of certain lipid soluble antibiotics in this 'protected' site, a two-phased nonsurgical pharmacological treatment is proposed for aviators. Two representative cases are reported that demonstrate such management within the setting of an operational USAF flight surgeon's office. Author

A90-10260
A CASE OF DECOMPRESSION SICKNESS IN A COMMERCIAL PILOT
CHRISTIAN W. WOLF, DIETMAR H. PETZL, GERALD SEIDL, and OTTO C. BURGHUBER (Wien, Universitaet, Vienna; Vienna Airport Clinic, Austria) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 60, Oct. 1989, Section I, p. 990-993. refs
Copyright

This paper reports a case of decompression sickness (DCS) followed by pulmonary edema in a 47-year-old commercial pilot who operated a nonpressurized turboprop twin at flight level 290. He became unconscious and recovered after an emergency descent. The pilot collapsed and a pulmonary edema occurred 8 h after landing. The patient improved rapidly with fluid replacement and without hyperbaric therapy, which was not available at that time. This course of DCS is unusual because it is reported that fluid replacement without hyperbaric therapy normally cannot recover severe cases of DCS. The considerable increase in body weight of this pilot within the last six months may have been a predisposing factor for the development of decompression sickness. Author

A90-10263
WHAT THE AIRCREW AUTOMATED ESCAPE SYSTEM AND AIRCREW LIFE SUPPORT SYSTEM EQUIPMENT DESIGNERS NEED FROM THE INVESTIGATING MEDICAL OFFICER AND PATHOLOGIST
FREDERICK C. GUILL (U.S. Navy, Naval Air Systems Command, Washington, DC) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 60, Oct. 1989, Section II, p. B1-B10. refs
Copyright

This paper discusses the kind of information needed by the designers and manufacturers of the aircrew automated escape systems (AAESs) and the aircrew life support systems (ALSSs), as well as by the AAES and ALSS acquisition personnel, from medical officers and pathologists investigating aviation mishaps. Particular aircraft parameters at the time of escape are investigated

and correlated with the egress problems. Major problems that need correction in the egress seats are pointed out. It is emphasized that the injury patterns and equipment damage patterns are of primary importance for a report of a mishap investigation. If properly examined, these mishaps will yield exceptionally valuable insights into AAES and ALSS problems and the reasons underlying system behavioral differences. I.S.

A90-10267
SELECTED ANATOMIC BURN PATHOLOGY REVIEW FOR CLINICIANS AND PATHOLOGISTS
MALCOLM N. GOODWIN, JR. (USAF, Hospital, Moody AFB, GA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 60, Oct. 1989, Section II, p. B39-B43. refs
Copyright

This paper describes selected examples of burn pathology that have special value for clinicians and pathologists not routinely involved in burn care during the initial 72 hours. It is pointed out that, in these particular cases, not all vital clinical considerations were addressed during this period. Specific recommendations are presented with respect to the initial management of the burn, which would enhance the subsequent care by a specialist in burn therapy. A new concept is proposed, relating fibrin degradation products to the development of shock lung. I.S.

A90-10268
ASCERTAINING THE CAUSAL FACTORS FOR 'EJECTION-ASSOCIATED' INJURIES
FREDERICK C. GUILL (U.S. Navy, Naval Air Systems Command, Washington, DC) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 60, Oct. 1989, Section II, p. B44-B71.
Copyright

This paper examines the causal factors in many ejection-associated injuries, together with methodologies useful in determining the causal factors. The phases of a total emergency are discussed in terms of the forces present that might either directly induce injury or initiate the conditions for injury. The combined results of statistical and nonstatistical examinations of ejection-associated injuries and noninjury ejections, reported by the U.S. Navy, are examined. Test information is presented depicting how certain types of thermal burn injuries might have been produced. Special attention is given to the role of the information on the injury location, descriptions and patterns as well as on the aircrew life support system equipment, and its usage and the recovered condition for determining the causal factor. I.S.

A90-10270
COMPATIBILITY OF THE AVIATION NIGHT VISION IMAGING SYSTEMS AND THE AGING AVIATOR
WARNER D. FARR (U.S. Army, Brooke Army Medical Center, Fort Sam Houston, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 60, Oct. 1989, Section II, p. B78-B80. refs
Copyright

The night vision goggle (NVG) system corrects up to +2.0 diopters of hyperopia, up to -6.0 diopters of myopia, and + or -1.0 diopter of astigmatism. To establish the extent of incompatibility of the NVG system among an aviator population older (39.5 yrs average age) than the active component aviators, a survey of 127 reserve-component aviators was conducted. Of these, 65.3 percent had 20/20 vision and were emmetropes. Of those that wore spectacles, 82.4 percent had hyperopia or myopia correctable by the built-in optical adjustments contained in the NVG. The remaining 17.6 percent of aviators who wore corrective lenses exceeded the corrective limits of the goggles. It is suggested that all medical personnel who support aviators using night vision systems should check their aviators for NVG compatibility. I.S.

A90-10271
MEASURING NASAL FUNCTION IN AVIATORS
CHARLES L. KALUZA (U.S. Naval Hospital, Millington, TN) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 60, Oct. 1989, Section II, p. B81, B82. refs
Copyright

The importance of nasal function in the overall health of man is well documented. The physiologic function of the nose is especially important in the harsh environment of military aviation. Present standards for evaluating nasal function in aviators are based primarily on subjective complaints and limited physical examinations. Rhinomanometry has been used for approximately 100 years for measuring nasal function. Otorhinolaryngologists have used modern rhinomanometric methods for the past 25 years. Rhinomanometry allows the measurement of airflow and pressure in the normal respiratory cycle through the nose. Present methods involve using a simple flow measuring device coupled with a pressure device to measure the pressure required to drive a given amount of air through the nose. Under current development are machines that will automatically measure the work required in movement of a quantity of air across the nose and allow storage of this data into a data management program so that standards can be developed and specific patients followed. It is proposed that rhinomanometry be adopted as an objective measurement of nasal function for use in the physical qualification of aviators. Its use in all people involved with aviation during routine flight physicals is also recommended. Author

A90-10272
ALLERGIC RHINITIS AND AVIATION
CHARLES L. KALUZA (U.S. Naval Hospital, Millington, TN) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 60, Oct. 1989, Section II, p. B83-B85. refs
Copyright

Allergic rhinitis, or hay fever, is a combination of symptoms that affects approximately 20 percent of the U.S. population. Symptoms include nasal congestion, sneezing, rhinorrhea, and sleep aberrations. Patients with mild or seasonal cases of allergic rhinitis are perfectly capable of performing adequately in the aviation field. At present, these people are grounded during symptomatic periods. This grounding is due to both Federal Air Regulations and Navy regulations which preclude flying with nasal congestion or with the use of medications. Current therapy of allergic rhinitis is based on the use of three different basic modalities. The first modality is immunotherapy which requires usually weekly injections, and the patient is grounded for 24 h after the injection. The second and most commonly used modality is the use of antihistamine-decongestant preparations. The third group of medications is the topical steroids and cromolyn sodium, which are reviewed in detail because of their improved efficacy and safety. Recommendations are proposed for allowing those persons with allergic rhinitis symptoms that are easily controlled with the topical steroids or cromolyn sodium to continue flying. Author

A90-10273
TOXICOLOGIC STUDIES ON USAF AIRCRAFT ACCIDENT CASUALITIES, 1973-1984
CHARLES J. RUEHLE (U.S. Armed Forces Institute of Pathology, Washington, DC) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 60, Oct. 1989, Section II, p. B86-B88.
Copyright

The Armed Forces Institute of Pathology analyzed toxicology specimens on 294 cases submitted by the U.S. Air Force from 1973 through 1984. The fatal population consisted of 196 cases of which 43 (22 percent) had positive toxicology results. Of the fatalities, 14 (7 percent) had positive drug analyses. The nonfatal group consisted of 98 cases; 14 were positive for toxicology, with six positive for drugs. These toxicologic findings are analyzed according to aircrew position, aircraft, and accident scenario parameters. Author

A90-10274
DETERMINING RISK OF HEART DISEASE AND OBESITY WITH A HAND-HELD PROGRAMMABLE CALCULATOR
W. DOUGLAS EVERETT (Texas, University, Dallas; John Peter

Smith Hospital, Fort Worth) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 60, Oct. 1989, Section II, p. B106-B109. refs
Copyright

A90-10831
PSYCHOPHYSIOLOGICAL MECHANISMS OF ADAPTATION AND THE FUNCTIONAL ASYMMETRY OF THE BRAIN [PSIKHOFIZIOLOGICHESKIE MEKHANIZMY ADAPTATSII I FUNKTSIONAL'NAIA ASIMMETRIIA MOZGA]
VITALII P. LEUTIN and ELENA I. NIKOLAEVA Novosibirsk, Izdatel'stvo Nauka, 1988, 193 p. In Russian. refs
Copyright

This book examines mechanisms responsible for the psychophysiological adaptation of humans to new climatic and geographic conditions. Special attention is given to the roles of memory, emotions, and the functional asymmetry of the brain in adaptation and to mental conditions inhibiting adaptation. New tests are proposed for the prediction of adaptational disturbances among the members of expeditions and workcrews who may become exposed to emotionally stressful situations. I.S.

A90-11079#
CHANGE OF CIRCADIAN RHYTHM OF SERUM CORTISOL LEVEL AFTER EASTWARD FLIGHT
NAOKO TAJIMA, KENTAROH FUJISHIRO, MITSUO SASAKI, ICHIRO ASUKATA, YUKO KUROSAKI (Japan Air Lines Co., Ltd., Flight Crew Medical Service Dept., Tokyo) et al. Japanese Journal of Aerospace and Environmental Medicine (ISSN 0387-0723), vol. 26, March 1989, p. 1-7. In Japanese, with abstract in English. refs

An effort is made to clarify the change of serum cortisol level after an eastward flight of 8 hours of time difference. Six male volunteers aged 22-24 years flew from Narita to San Francisco and spent 7 days with a controlled schedule. Blood was drawn at 7:00, 15:00, and 23:00 in Tokyo as a baseline study and in San Francisco for day 0 to day 7. Urine was collected every 8 hours for the determination of 17-KS and 17-OHCS. Diurnal variation of serum cortisol level began to show an irregularity with small amplitude for day 2 to day 5. Resynchronization occurred on day 4 in the earliest case and on day 7 at the latest. Change of circadian rhythm of urinary 17-KS and 17-OHCS did not show a consistent pattern. Total excretion of urinary 17-KS and 17-OHCS tended to increase on day 0 to day 1; however, it did not reach statistically significant level. The results indicate that it requires about 7 days to adapt to the new situation after eastward flight with 8 hours of time difference. Author

A90-11080#
EFFECT OF LONG-HAUL FLIGHT WITH TIME ZONE SHIFT ON DIURNAL RHYTHMS OF THE NEOCORTEX AND ADRENO-SYMPATHETIC FUNCTION IN MEN
MASATOSHI SHIOTA, MASAMICHI SUDOH, and NOBUO MATSUMOTO (Jikei University, Tokyo, Japan) Japanese Journal of Aerospace and Environmental Medicine (ISSN 0387-0723), vol. 26, March 1989, p. 9-17. In Japanese, with abstract in English. refs

The effect of long-haul flight with time-zone shift on the diurnal rhythms of the neocortex and adrenosympathetic nervous function is studied. Particular attention is given to the relationship between the diurnal rhythms of the critical fusion frequency (CFF) level and other rhythms indicative of adrenosympathetic nervous function. The least squares method is used to study the effect of long-haul flight with time-zone shift on the predicted acrophase of diurnal rhythms of CFF, adrenaline, noradrenaline, and 17-hydroxy-corticosteroid excretion in urine. K.K.

A90-11500* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
THREE-DIMENSIONAL STRUCTURE OF HUMAN SERUM ALBUMIN
DANIEL C. CARTER, XIAO-MIN HE, SIBYL H. MUNSON, PAMELA D. TWIGG, KIM M. GERNERT, M. BETH BROOM, and TERESA Y. MILLER (NASA, Marshall Space Flight Center, Huntsville, AL) Science (ISSN 0036-8075), vol. 244, June 9, 1989, p. 1195-1198. refs
Copyright

The three-dimensional structure of human serum albumin has been solved at 6.0 A resolution by the method of multiple isomorphous replacement. Crystals were grown from solutions of polyethylene glycol in the infrequently observed space group P42(1)2 and diffracted X-rays to lattice d-spacings of less than 2.9 A. The electron density maps are of high quality and revealed the structure as a predominantly alpha-helical globin protein in which the course of the polypeptide can be traced. The binding loci of several organic compounds have been determined. Author

A90-12275
PATHOGENESIS OF THE PAIN SYNDROME IN PILOTS DURING THE COURSE OF A PROLONGED FLIGHT, AND ITS PROPHYLAXIS [PATOGENEZ BOLEVOGO SINDROMA U LETCHIKOV V DLITEL'NOM POLETE I EGO PROFILAKTIKA]
V. A. VARFOLOMEEV Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), Aug. 1989, p. 46-48. In Russian. refs
Copyright

Direct causes of fatigue-induced pain that develops in various parts of the body of a pilot during a long-distance flight are discussed, with particular consideration given to the causes of pain in the loin, the shin and foot, the neck, and the shoulder areas. Among the major causes of the pain syndrome that were identified are hypodynamia; the compression of tissues in the areas of contact with the pilot's seat; changes in the curvature of the vertebral column in the area of the loin which has no contact with the seat back; the effect of increased hydrostatic blood pressure caused by vertical leg position; and prolonged localized static strain in certain muscle groups. Measures designed to remove or alleviate these causes are discussed. I.S.

A90-12409
RESONANCE EFFECTS IN THE EEG DURING PHOTOSTIMULATION WITH VARIABLE-FREQUENCY FLASHES. II - REGIONAL CHARACTERISTICS OF RESONANCE EFFECTS [REZONANSNYE IAVLENIIA V EEG PRI FOTOSTIMULIATSII S MENIAIUSHCHEISIA CHASTOTOI VSPYSHEK. II - REGIONAL'NYE OSOBENNOSTI REZONANSNYKH EFFEKTOV]
A. I. FEDOTCHEV, A. T. BONDAR', and V. F. KONOVALOV (AN SSSR, Institut Biologicheskoi Fiziki, Pushchino, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 15, July-Aug. 1989, p. 3-10. In Russian. refs
Copyright

The effects of frequency changes in flash-stimuli on the EEG spectrum of humans was investigated in 10 male subjects presented with flashing-light stimuli whose frequency changed linearly from 1 to 15 Hz and then back to 1 Hz. Frequency-specific effects of photostimulation on hemispheric and regional characteristics of EEG were identified. It was found that the resonance effects in EEG, observed when the photostimulation frequency coincided with the intrinsic cerebral rhythm, and their hemispheric asymmetry were greatest in the occipital region of the cortex. I.S.

A90-12410
CHARACTERISTICS OF BODY-TEMPERATURE REGULATION AND THE FUNCTIONAL ACTIVITY OF HUMAN-SKIN RECEPTORS DURING SEASONAL ADAPTATION TO HIGH TEMPERATURE IN AN ARID AREA [OSOBENNOSTI REGULIATSII TEMPERATURY TELA I FUNKTSIONAL'NAIA AKTIVNOST' TERMORETSEPTOROV KOZHI U CHELOVEKA PRI SEZONNOI ADAPTATSII K VYSOKOI TEMPERATURE ARIDNOI ZONY]
M. D. KHUDAIBERDIEV and L. M. POKORMIAKHA (AN TSSR, Institut Fiziologii i Eksperimental'noi Patologii Aridnoi Zony, Ashkhabad, Turkmen SSR) Fiziologiia Cheloveka (ISSN

0131-1646), vol. 15, July-Aug. 1989, p. 87-91. In Russian. refs
Copyright

A90-12411
PSYCHOLOGICAL STATUS AND THE METABOLISM LEVEL UNDER CONDITIONS OF HIGH TEMPERATURE AND HUMIDITY [PSIKHOLOGICHESKII STATUS I SOSTOIANIE METABOLIZMA PRI DEISTVII VYSOKOI TEMPERATURY I VLAZHNOSTI]
A. S. SHANAZAROV, V. P. MAKHNOVSKII, and E. I. KUZIUTA (AN KSSR, Institut Fiziologii i Eksperimental'noi Patologii Vysokogor'ia, Frunze, Kirgiz SSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 15, July-Aug. 1989, p. 92-96. In Russian. refs
Copyright

The effects of high temperature and humidity (50 C at 80 percent relative humidity) on the mental and physical conditions of humans were investigated by estimating the parameters of logical-thought capacity and attention and metabolic indices (including the blood contents of adrenalin, noradrenalin, malonic dialdehyde, and bilirubin) in subjects aged 18-20 y. It was found that the exposure to high temperature-high humidity conditions caused large increases in the release of adrenaline and noradrenaline (by 68.9 and 151.4 percent, respectively) and bilirubin (54.8 percent at the threshold heat-stress exposure). These metabolic changes were accompanied by significant declines in the logical thinking capacity and the attention span. I.S.

N90-10523# Army Research Inst. of Environmental Medicine, Natick, MA.
CONTROL OF THERMOREGULATORY SWEATING DURING EXERCISE IN THE HEAT
MICHAEL N. SAWKA, RICHARD R. GONZALEZ, ANDREW J. YOUNG, RICHARD C. DENNIS, C. ROBERT VALERI, and KENT B. PANDOLF Oct. 1988 26 p
(Contract N00014-79-C-0168; DA PROJ. 3E1-6287-A-879)
(AD-A206001; USARIEM-M4-89) Avail: NTIS HC A03/MF A01 CSCL 06/4

The purposes of this study are to: (1) determine if erythrocyte infusion alters the control of thermoregulatory sweating; and (2) demonstrate how increases and decreases of both plasma tonicity and blood volume influence the thermoregulatory control parameters of threshold temperature and sweating sensitivity. Six non-heat acclimated and five heat acclimated males attempted Heat Stress Tests (HST's) both before and shortly after (48 to 96h) autologous erythrocyte infusion. The non-heat acclimated subjects were euhydrated for both HST's; whereas, the heat acclimated subjects were studied in a euhydrated and a hypohydrated (-5 percent body weight) condition both pre- and post-infusion (500 ml of solution containing approximately 60 percent hct of autologous erythrocytes). The HST's consisted of treadmill exercise (335 W.m) in a hot (35 C, 45 percent relative humidity) environment, and esophageal temperature and local sweating rate were continuously measured during 25 minutes of exercise. These experiments resulted in a matrix of conditions where both plasma tonicity and blood volume were increased or decreased relative to control conditions (euhydration, pre-infusion). The findings concerning thermoregulatory sweating during exercise in the heat are summarized: acute polycythemia will decrease the threshold temperature and increase the sweating sensitivity; and both threshold temperature and sweating sensitivity are increased or decreased from control levels dependent upon the combined influence of plasma tonicity and blood volume; threshold temperature changes are primarily influenced by plasma tonicity, and sweating sensitivity changes are primarily influenced by blood volume. GRA

N90-10524* National Aeronautics and Space Administration, Washington, DC.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 328)
Feb. 1989 48 p
(NASA-SP-7011(328); NAS 1.21:7011(328)) Avail: NTIS HC A03; NTIS standing order as PB89-912300, $10.50 domestic, $21.00 foreign CSCL 21/5

This bibliography lists 104 reports, articles and other documents introduced into the NASA Scientific and Technical Information System during September, 1989. Subject coverage includes: aerospace medicine and psychology, life support systems and controlled environments, safety equipment, exobiology and extraterrestrial life, and flight crew behavior and performance.
Author

N90-10525# Lawrence Livermore National Lab., CA.
MANAGING HUMAN EXPOSURE AND HEALTH RISKS: AN INTEGRATED APPROACH AND THE ROLE OF UNCERTAINTY
THOMAS E. MCKONE Mar. 1989 10 p Presented at the 8th World Clean Air Congress and Exhibition, The Hague, Netherlands, 11-15 Sep. 1989 Submitted for publication
(Contract W-7405-ENG-48)
(DE89-008611; UCRL-100511; CONF-890909-1) Avail: NTIS HC A02/MF A01

Human populations contact environmental pollutants through food, water, and air in varying amounts each day throughout a lifetime. A realistic strategy for managing health risks of environmental contaminants therefore requires a comprehensive and integrated approach. Using examples for exposure to contaminants in potable water and to contaminants transferred from air to food, two important issues in exposure assessment are considered: the completeness of current exposure models and the treatment of uncertainty in exposure estimates. The results indicate that risk managers should consider the potential for multiple pathways, avoid risk assessments derived from single value estimates, be aware of the uncertainty in risk estimates, and include this awareness in their decisions. DOE

N90-10526# Tel-Aviv Univ. (Israel). Eye Research Inst.
TREATMENT OF LASER-INDUCED RETINAL INJURIES Final Report, 12 Feb. 1985 - 31 Jan. 1987
MICHAEL BELKIN and NAVA NAVEH 29 Jun. 1989 36 p
(Contract DAMD17-85-G-5013)
(AD-A210284) Avail: NTIS HC A03/MF A01 CSCL 06/15

The effect of steroids known for their inflammatory effect on the laser-induced retinal injury is investigated. In an attempt to minimize this, prostaglandin E2 (PGE2), known for their mediatory-role in any inflammatory reaction were studied as well as changes in protein leakage. The latter is indicative of blood retinal barrier disruption. The study revealed an enhanced PGE2 response as manifested by excessive production in vitro of PGE2 by the retina/choroid of laser-exposed eyes and accumulation of both PGE2 and protein in the vitreous body to above prelaser values. Corticosteroid treatment abolished the increase in the vitreal PGE2 response, but it only partially reduced the excessive PGE2 production in vitro by retina/choroid. Treatment was effective during the first week, but later failed. The finding of the transient nature of the anti-PGE2 effect of the steroids does not necessarily point to the steroids inefficacy as anti-inflammatory agents, but rather may point to the cytoprotective nature of PGs themselves. GRA

N90-10527# Medical Coll. of Wisconsin, Milwaukee. Dept. of Neurosurgery.
BIOMEDICAL INFLUENCES ON SPINAL CORD FUNCTION Final Report, 1 Sep. 1977 - 31 Aug. 1987
ANTHONY SANCES, JR. 14 Jun. 1989 40 p
(Contract N00014-77-C-0749)
(AD-A210311) Avail: NTIS HC A03/MF A01 CSCL 06/10

These studies were directed to delineate the mechanisms of injury to the human brain and spinal cord during impact injury such as that experienced by Navy Air Force personnel and other military personnel during typical military and non-military maneuvers. The program was conducted in concert with the Office of Naval Research and the Biodynamics Laboratory in New Orleans, LA. Our group of biomedical engineers and neurosurgeons provided assistance for the biodynamics program in the evaluation of impact injury to non-human primates. Evoked potentials were used to measure the alterations in neurological function secondary to

inertial impact produced on the HYGE sled in New Orleans at -x G levels up to approximately 100. The pathological evaluations were conducted in New Orleans by consultants and Navy personnel, and our personnel at the Medical College of Wisconsin provided the neurosurgical and biomechanical and bioengineering expertise to assist these studies. In addition, basic studies were conducted to evaluate spinal cord injury function in non-human primates and in human cadaveric tissues to determine the mechanical properties and strengths to further understand potential mechanisms of injury in military personnel. GRA

N90-10528# Health Effects Research Lab., Research Triangle Park, NC.
HUMAN HEALTH STUDIES OF CARBON MONOXIDE (CO) UNDER CONDITIONS OF MILITARY WEAPONS SYSTEMS CREWMAN EXPOSURES. PROTOCOL 1: FORMATION OF COHB Final Report, Sep. 1982 - Mar. 1985
VERNON A. BENIGNUS, ed., MILAN HAZUCHA, MATHEW L. PETROVICK, MICHAEL L. MCCARTNEY, and PAUL N. KIZAKEVICH (Research Triangle Inst., Research Triangle Park, NC.) 29 Sep. 1988 128 p
(Contract DA PROJ. 3E1-62787-A-878)
(AD-A210344) Avail: NTIS HC A07/MF A01 CSCL 24/1

The present experiment was performed as a first step to evaluate the accuracy of prediction of carboxyhemoglobin (COHb) formation due to quasi steady state carbon monoxide (CO) exposure by use of the Coburn-Forster-Kane equation (CFKE) and related models. Thirteen healthy young males were exposed to CO in room air for 120 minutes. While they were being exposed to CO, they either rested or performed bicycle exercise at one of two moderate work levels (25 or 40 Watts). Also during exposure to CO, blood samples were drawn every fine min to assess the COHb level. Many of the variables of the CFKE were measured in individual subjects rather than using published norms. GRA

N90-10529# Defence Research Establishment, Ottawa (Ontario). Environmental Protection Section.
MEASUREMENT OF RESPIRATORY AIR TEMPERATURES AND CALCULATION OF RESPIRATORY HEAT LOSS WHEN WORKING AT VARIOUS AMBIENT TEMPERATURES
J. B. CAIN, S. D. LIVINGSTONE, R. W. NOLAN, and A. A. KEEFE Mar. 1989 23 p
(AD-A210378; DREO-1004) Avail: NTIS HC A02/MF A01 CSCL 06/4

Heat loss due to respiration can represent a sizable portion of the body's total heat loss. The temperature and humidity of expired air are important in determining the respiratory heat loss since this heat loss depends upon, among other things, the difference between the inspired and expired air temperatures and the change in the absolute humidity of the respired air. The purpose was to establish the temperature and humidity of the expired air of subjects working at various metabolic rates at ambient temperatures between -40 and 20 C in order to calculate the heat loss from the body due to respiration. Measurements of the respired air temperature and water vapor content were made for five subjects while they either stood or walked on a treadmill. The results indicated that the maximum respired air temperature varied slightly with the ambient air temperature but changes in metabolic rate, respiration rate and breathing frequency had no apparent effect on the expired air temperature under the conditions studied. The relative humidity of the respired air was found to be close to saturation in the extreme-cold environments. Heat loss due to respiration was calculated and the influence of various physiological and environmental variables on the respiratory heat loss is discussed. GRA

N90-10530# Army Aeromedical Research Lab., Fort Rucker, AL.
HUMAN PERFORMANCE IN CONTINUOUS/SUSTAINED OPERATIONS AND THE DEMANDS OF EXTENDED WORK/REST SCHEDULES: AN ANNOTATED BIBLIOGRAPHY, VOLUME 2 Final Report, 1985 - 1989
GERALD P. KRUEGER and SUZANNE M. BARNES Jun. 1989 77 p
(AD-A210504; USAARL-89-8) Avail: NTIS HC A05/MF A01 CSCL 05/8

A society intent upon maintaining high productivity levels 24 hours per day, and on providing a variety of services around the clock, produced occupations and circumstances requiring prolonged, continuous work periods. The performance of workers under conditions of sustained or continuous work has become an important topic in industrial psychology, and in particular, in the military services. There are some traditional jobs, circumstances, and even some new occupations that involve prolonged, sustained work periods without rest, in which individual workers continue beyond the normal 8 to 10 hour work day. In many of these sustained work situations, the termination point for a shift is unknown. Such activities usually require prolonging physical stamina and sustaining high levels of organizational and cognitive effectiveness. These continuous operations are of two types: First, there are extended operations, jobs, or tasks that proceed continuously with only a short break or breaks, but that operate within a typical shift system for lengthy periods, longer that a normal duty day. The worker knows he or she will be relieved or able to rest. Second, there are sustained operations, planned or unplanned, goal-oriented, nonstop continuous performance/ operations without allowance for rest or sleep, in which the worker is expected to keep going as long as he or she can. Both have very important worker performance and behavioral implications. GRA

N90-10531# Naval Research Lab., Washington, DC. Polymeric Materials Branch.
EYE/SENSOR PROTECTION AGAINST LASER IRRADIATION ORGANIC NONLINEAR OPTICAL MATERIALS Final Report, Apr. - Dec. 1988
MICHAEL E. BOYLE and ROBERT F. COZZENS 12 Jun. 1989 100 p
(AD-A210599; NRL-MR-6482) Avail: NTIS HC A05/MF A01 CSCL 06/5

Recent developments in organic nonlinear optical materials for application to eye and sensor protection are reviewed. This compendium includes a brief discussion of the functioning of the eye, delineation of some of the important eye protection parameters and an introduction to the origin of nonlinear optical effects and how they are measured. Specific examples of proposed or prototyped protection devices are also presented. A compilation of noteworthy organic third-order nonlinear optical materials is included as an appendix. Lasers are playing an important and increasing role in modern society. Their present uses range from compact disc players to optical data storage and communication systems. Because of this wide spread use, the continuing expansion of lasers into other arenas and the low damage thresholds of human eyes and electro-optic sensors, there is increasing concern about eye and sensor protection from laser irradiation. GRA

N90-10532# California Univ., Irvine.
EXCITATORY AMINO ACIDS AS TRANSMITTERS IN THE BRAIN Final Report, 1 May 1986 - 30 Apr. 1989
C. W. COTMAN 30 Apr. 1989 12 p
(Contract DAAL03-86-K-0067)
(AD-A210685; ARO-23200.9-LS) Avail: NTIS HC A03/MF A01 CSCL 06/5

The overall goal of this work was to carry out an indepth study of the properties of the excitatory amino acid neurotransmitter receptors. These receptors represent an integral part of the central nervous system, as they are responsible for the majority of the excitatory synaptic transmission, as well as being involved in higher order processes such as plasticity and excitotoxicity. Considerable advances have been made in our understanding of these receptors. The results of these studies are summarized below with respect to each of the receptor classes. GRA

N90-10533# Naval Health Research Center, San Diego, CA. Dept. of Sleep Research.
DAYTIME SLEEPINESS, PERFORMANCE, MOOD, NOCTURNAL SLEEP: THE EFFECT OF BENZODIAZEPINE AND CAFFEINE ON THEIR RELATIONSHIP Interim Report
L. C. JOHNSON, C. L. SPINWEBER, S. A. GOMEZ, and L. T. MATTESON 1 Mar. 1989 27 p
(AD-A210915; NHRC-89-7) Avail: NTIS HC A03/MF A01
CSCL 06/10

Daytime sleepiness is not only a clinical and research problem, it can have consequences in operational settings. Sleepiness and alertness are generally viewed as reciprocal and were viewed as a function of the circadian cycle and of prior sleep and wakefulness. It was clearly established that total or partial sleep loss results in decreased alertness and impaired performance, but the magnitude of the relationship between sleepiness and performance decrement was not determined. The relationships between daytime sleepiness, performance, mood and nocturnal sleep and how these relationships were influenced by the nighttime use of a benzodiazepine and ingestion of caffeine in the morning were further examined. Objective measures of daytime sleepiness were not significantly related to either performance or mood through those with greater sleep tendency generally reported better mood. Subjects with greater daytime sleep tendency had significantly longer and more efficient nocturnal sleep. Neither benzodiazepine or caffeine influenced these relationships. In contrast, higher subjective estimates of sleepiness were significantly associated with poorer mood and tended to be related to poorer performance. Subjects receiving caffeine did not show these relationships. Nocturnal sleep measures were not related to subjective estimates of daytime sleepiness. GRA

N90-10534# Massachusetts Univ., Amherst.
BIOLOGICAL INVESTIGATIONS OF ADAPTIVE NETWORKS: NEURONAL CONTROL OF CONDITIONED RESPONSES Final Report, 1 Jun. 1986 - 18 Jul. 1989
JOHN W. MOORE Jul. 1989 53 p
(Contract AF-AFOSR-0182-86)
(AD-A211043; AFOSR-89-1016TR) Avail: NTIS HC A04/MF A01
CSCL 05/8

Investigations of adaptive neutral networks were conducted using the classically conditioned nictitating membrane response (NMR) of rabbits. Work involved both neurobiological and theoretical approaches based on mathematical models and computer simulation. Recordings were done from single brain stem neurons in awake, behaving animals for the purpose of determining the loci and activity relationship to CRs (conditioned responses). Computational tools for applying systems analysis to neurophysiological data obtained from single-unit recordings from awake behaving animals were developed. The relationship between single neurons' dynamic behavior and the CR was characterized in terms of differential equations and sophisticated correlational analyses based on Fourier and Laplace transform methods. Theoretical studies revolved around two mathematical models of learning. The Sutton-Barto-Desmond (SBD) model was designed to describe real-time features of the NM CR. A cerebellar network implementation of this model was constructed by combining parametric constraints of the model dictated by behavioral data with constraints based on anatomy and physiology of the cerebellum. The second major theoretical development was the construction of a two-element neural-network architecture that elegantly describes adaptive timing as manifested in the fine-grain temporal characteristics of CRs. GRA

N90-10535# California Univ., San Diego, La Jolla. Dept. of Psychiatry.
EXTRATHALAMIC MODULATION OF CORTICAL FUNCTION Interim Report, 1 Apr. 1988 - 31 Mar. 1989
STEPHEN L. FOOTE 15 Jul. 1989 6 p
(Contract F49620-87-C-0038)
(AD-A211044; AFOSR-89-1012TR) Avail: NTIS HC A02/MF A01
CSCL 06/4

The focus of the research is to understand the role that the widely-divergent, globally-acting locus coeruleus (LC)-noradrenergic (NA) system plays in sensory information processing. Completed light-microscopic studies of the regional and laminar distribution of cortical innervation by extrathalamic systems (e.g., noradrenergic, cholinergic, serotonergic, and dopaminergic) indicate that axons of each system exhibit a different density and laminar distribution. They also display individual developmental sequences in terms of the time terms of the time when innervation begins and the evolution of its specialized laminar distribution in each cortical region. These anatomic data support the proposal that each extrathalamic system contacts a distinct population of neurons in specific cortical regions. Each population of neurons may be involved in different aspects of cortical regions. Cellular electrophysiology studies suggest that activity in the LC-NA has specific modulatory effects on the sensory responsiveness of cortical neurons. It alters the excitatory and inhibitory components of these sensory responses. Functionally, the LC-NA system may be involved in the orienting and attentional mechanisms. GRA

N90-11439# Carnegie-Mellon Univ., Pittsburgh, PA. Dept. of Engineering and Public Policy.
BIOLOGICAL EFFECTS OF POWER FREQUENCY ELECTRIC AND MAGNETIC FIELDS: BACKGROUND PAPER
INDIRA NAIR, M. GRANGER MORGAN, and H. KEITH FLORIG May 1989 114 p Sponsored by Office of Technology Assessment, Washington, DC
(PB89-209985; OTA-BP-E-53) Avail: NTIS HC A06/MF A01; SOD HC $4.75 as 052-003-01152-2 CSCL 06/16

Electric and magnetic fields produced by electric power systems have recently been added to the list of environmental agents that are a potential threat to public health. The paper describes exposures to fields from power systems and other sources, reviews existing scientific evidence on the biological effects of these fields, presents a history of research support and of regulatory activity, and discusses problems and alternatives in regulatory action. If exposure to fields does turn out to pose a health risk, it is unlikely that high voltage transmission lines will be the only sources of concern. Power-frequency fields are also produced by distribution lines, wall wiring, appliances, and lighting fixtures. These non-transmission sources are much more common than transmission lines and could play a far greater role than transmission lines in any public health problem. Author

N90-11440# Naval Health Research Center, San Diego, CA.
TEST-RETEST RELIABILITY OF OXFORD MEDILOG 9000 SLEEP RECORDING AND SS-90-3 SLEEP STAGE SCORING Interim Report
DAVID G. MCDONALD (Missouri Univ., Columbia.) and LORENE IRWIN 13 Mar. 1989 11 p
(AD-A211165; NHRC-89-6) Avail: NTIS HC A03/MF A01
CSCL 06/4

Sleep was recorded in 19 normal sleepers (19.3 to 63.5 years of age) one night at home, using the Medilog 9000 system to assess the reliability of the Medilog SS-90-3 Sleep Stager by comparing sleep scoring of the same records scored five times. Primary results were: (1) Sleep Stager scoring of most sleep measures was highly reliable, with alpha coefficients ranging from .98 to 1.00 for total sleep time, movement time, sleep onset, waking after sleep onset, and both absolute and percentage amounts of sleep stages 1 to 4 and REM; and (2) scoring of latency measures was less reliable, although certainly acceptable for REM latency and marginally acceptable for stage 2 and 3 latencies, but not acceptable for an automated scoring of stage 4 latency. GRA

53

BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

A90-10244
SELECTIVITY AND DIVISIBILITY OF ATTENTION AS A PREDICTOR OF SUCCESS IN PILOT TRAINING [SELEKTYWNOSC I PODZIELNOSC UWAGI JAKO PREDYKTOR POWODZENIA W NAUCE PILOTAZU]
KAZIMIERZ MIGDAL (Wojskowy Instytut Medycyny Lotniczej, Warsaw, Poland) Postepy Astronautyki (ISSN 0373-5982), vol. 22, no. 1-2, 1989, p. 37-45. In Polish. refs
Copyright

Results are presented from an experiment on the possible use of attention selectivity and divisibility as predictors for successful pilot training. Subjects were tested for choice response to orders appearing on a screen as worded texts. The response to colored optical signals and acoustic signals were also tested. A high positive correlation (0.542) was found between test responses and results from TS-11-Iskra training flights. R.B.

A90-10245
THE EFFECTS OF THE SCHULTZ-LUTHE RELAXATION TECHNIQUE ON PERCEPTUAL-MOTOR PERFORMANCE IN GROUP PSYCHOTHERAPY SUBJECTS [WPLYW RELAKSACJI METODA SCHULTZA-LUTHEGO NA SPRAWNOSC PERCEPCYJNO-MOTORYCZNA U OSOB PODDANYCH PSYCHOTERAPII GRUPOWEJ]
JANINA MACIEJCZYK (Wojskowy Instytut Medycyny Lotniczej, Warsaw, Poland) and KRYSTYNA KOTOWA Postepy Astronautyki (ISSN 0373-5982), vol. 22, no. 1-2, 1989, p. 47-54. In Polish. Research supported by the Polska Akademia Nauk. refs
Copyright

The effects of relaxation on increasing perceptual-motor performance are examined. The relaxation training was used parallel to group psychotherapy. Considerable improvements were found in performance levels in relation to the applied tests, measuring perceptual-motor performance as affected by relaxation. Author

A90-10248
SOME PERSONALITY DETERMINANTS OF PERCEPTUAL-MOTOR PERFORMANCE [NIEKTORE OSOBOWOSCIOWE DETERMINANTY SPRAWNOSCI PERCEPCYJNO-MOTORYCZNEJ]
JAN TERELAK and JANINA MACIEJCZYK (Wojskowy Instytut Medycyny Lotniczej, Warsaw, Poland) Postepy Astronautyki (ISSN 0373-5982), vol. 22, no. 1-2, 1989, p. 69-82. In Polish. refs
Copyright

Psychological determinants of performance levels in sensorimotor task-learning are examined, for the task of tracking a light target with motoric compensation through upper and lower limb movement. The relation between aggressivity and performance level were tested using a group of 145 17-year-old men. The results show correlations between aggressivity features and performance in learning sensorimotor functions. It is found that aggressivity influences the structure of sensorimotor functions, especially during the initial stage of learning visual-motor coordination. R.B.

A90-10261
GEOGRAPHIC DISORIENTATION - APPROACHING AND LANDING AT THE WRONG AIRPORT
MELCHOR J. ANTUNANO, STANLEY R. MOHLER, and JOHN W. GOSBEE (Wright State University, Dayton, OH) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 60, Oct. 1989, Section I, p. 996-1004. refs
Copyright

Geographic disorientation in aviation operations results from the failure of an aircrew to recognize and/or maintain the desired position relative to the external ground and airspace environment. Becoming lost during flight, intruding inadvertently into unauthorized airspace, selecting a wrong airway, landing on the wrong runway, and approaching the wrong airport - with or without actual landing - are some examples of inflight geographic disorientation. This is a relatively common phenomenon that can be experienced by any pilot, regardless of experience level and the type of pilot certification. This paper analyzes 75 cases of geographic disorientation that occurred among air carrier pilots plus 16 cases among general aviation pilots between 1982 and 1987. Inflight geographic disorientation can result from a variety of aeromedical and human factors (aircrew, operational, environmental) which, interacting with each other, create the ideal conditions for the occurrence of this phenomenon. The adverse consequences of geographic disorientation for the aircrew, passengers and aircraft are delineated along with specific preventive measures. Author

A90-10530*# Houston Univ., Clear Lake, TX.
THE EVALUATIVE IMAGING OF MENTAL MODELS - VISUAL REPRESENTATIONS OF COMPLEXITY
CHRISTOPHER DEDE (Houston, University, Clear Lake, TX) IN: AIAA Computers in Aerospace Conference, 7th, Monterey, CA, Oct. 3-5, 1989, Technical Papers. Part 1. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 433-438. Research supported by USAF and NASA. refs
(AIAA PAPER 89-3030) Copyright

The paper deals with some design issues involved in building a system that could visually represent the semantic structures of training materials and their underlying mental models. In particular, hypermedia-based semantic networks that instantiate classification problem solving strategies are thought to be a useful formalism for such representations; the complexity of these web structures can be best managed through visual depictions. It is also noted that a useful approach to implement in these hypermedia models would be some metrics of conceptual distance. V.L.

A90-10549#
AN INTELLIGENT INSTRUMENT FLIGHT TRAINER
J. WESLEY REGIAN (USAF, Human Resources Laboratory, Brooks AFB, TX) IN: AIAA Computers in Aerospace Conference, 7th, Monterey, CA, Oct. 3-5, 1989, Technical Papers. Part 2. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 589-595. refs
(AIAA PAPER 89-3055)

An instrument flight trainer (INFLITE) designed to test the concept of using artificial intelligence to train high-performance tasks is described. The prototype system trains students to land a simulated aircraft using instruments only. Consideration is given to automatic and controlled processing, component training, and time-compressed training. K.K.

A90-13132
PERCEPTION OF MULTIPLE TRANSPARENT PLANES IN STEREO VISION
DAPHNA WEINSHALL (MIT, Cambridge, MA) Nature (ISSN 0028-0836), vol. 341, Oct. 26, 1989, p. 737-739. Research supported by the U.S. Navy, DARPA, NSF, and Alfred P. Sloan Foundation. refs
Copyright

A situation in stereo matching is described in which a repetition of a random dot pattern leads to the perception of multiple transparent planes under some conditions and of a single opaque plane under other conditions. This result shows that stereo matching is not necessarily unique. A given point of the image in one eye may be matched simultaneously to more than one point in the other eye, each match defining a different depth plane. Current stereo matching algorithms in computer vision do not account for these observations. C.D.

N90-10536# Air Univ., Maxwell AFB, AL. Airpower Research Inst.
THE EFFECT OF HIGHER EDUCATION VARIABLES ON CADET PERFORMANCE DURING 1987 LIGHT AIRCRAFT TRAINING
LARRY E. BAKER May 1989 254 p
(AD-A210199; AU-ARI-88-9) Avail: NTIS HC A12/MF A01
CSCL 05/6

Based on the data analysis, it was concluded that a significant relationship is evident between 3 of the higher education curriculum variables: prior flying time, athletics, and portions of the Air Force Officer Qualifying Test; and subject performance in the light aircraft training (LATR) program for Air Force Reserve Officer Training Corps cadets conducted at Embry-Riddle Aeronautical University during the summer of 1987. The curricular variables that proved significant are identified, why the relationship occurred is analyzed, and the possible ramifications of such a relationship are discussed. The 1987 LATR program provided a unique opportunity to explore the question of what specific variables may influence a qualified individual's ability to pilot military aircraft. The specificity of the research design prevents accurate statistical inference to other subject populations and flight training programs. However, the implications of the study are clear: the men and women selected for Air Force pilot training over the past 20 years have been very similar, the basic selection criteria have remained consistent. The rate of attrition from the undergraduate pilot training program has also remained somewhat consistent, with variations being detected as supply and demand change. The LATR research study was clear in indicating that many of the selection criteria did not relate to flying performance. With the similarity of populations, it is very possible that these variables also have no effect on undergraduate pilot training or operational flying. GRA

N90-10537# University of Southern California, Los Angeles. Dept. of Psychology.
INTEGRATION OF NEUROBIOLOGICAL AND COMPUTATIONAL ANALYSES OF THE NEURAL NETWORK ESSENTIALS FOR CONDITIONED TASTE AVERSIONS Progress Report No. 1
KATHLEEN C. CHAMBERS 30 Jun. 1989 52 p
(Contract N00014-89-J-1296)
(AD-A210228) Avail: NTIS HC A04/MF A01 CSCL 06/4

The general goal of the ONR project is to determine the neural basis of learning and memory, i.e., how the brain stores and retrieves memory. More specifically, how the hard-wired (innate) part of the neural system interfaces with the plastic (learned) part is determined. The special form of learning which is the focus of this project is conditioned taste aversions (CTAs), i.e., learned aversions to the taste of a food or fluid when consumption of that substance is followed by illness. In order to achieve this general goal, neurobiological and computational analyses of the neural network essentials for CTA are being integrated. The essential neurobiological network for models for the CTA neural circuit are being developed. GRA

N90-10538# Case Western Reserve Univ., Cleveland, OH. Dept. of Psychology.
MODELS OF MENTAL FUNCTIONING Final Report, 15 Jun. 1987 - 14 Dec. 1988
DOUGLAS K. DETTERMAN 14 May 1989 15 p
(Contract AF-AFOSR-0227-87; AF PROJ. 2313)
(AD-A210456; AFOSR-89-0813TR) Avail: NTIS HC A03/MF A01
CSCL 05/8

The purpose of this research was to develop models of basic cognitive tasks developed in previous research. A model of choice reaction time was written in Simscript 2.5 but development of this model made it clear that additional information was required before good models of basic cognitive tasks could be devised. Therefore, a number of experiments were conducted which were designed to provide the basic information needed. The experiments focused on several questions important to the construction of explicit models. Some of these questions were: How do subjects build mental models of instructions and to what extent do the goodness of these models affect subsequent performance. What aspects of stimulus structure are important in the encoding of the stimuli used in these tasks. Seven experiments addressing these issues were conducted. In general, results suggest that basic cognitive tasks are far more complex than had previously been thought. GRA

N90-10539# Chicago Univ., IL. Speech Research Lab.
ATTENTION AND VIGILANCE IN SPEECH PERCEPTION Final Report, 1 Jul. 1987 - 31 Dec. 1988
HOWARD C. NUSBAUM 23 Jun. 1989 72 p
(Contract AF-AFOSR-0271-87; AF PROJ. 2313)
(AD-A210493; AFOSR-89-0963TR) Avail: NTIS HC A04/MF A01
CSCL 05/8

Research is described which was carried out in three related projects investigating the function and limitations of attention in speech perception. The projects were directed at investigating the distribution of attention in time during phoneme recognition, perceptual normalization of talker differences, and perceptual learning of synthetic speech. The first project demonstrates that in recognizing phonemes listeners attend to earlier and later phonetic context, even when that context is in another syllable. The second project demonstrated that there are two mechanisms underlying the ability of listeners to recognize speech across talkers. The first, structural estimation, is based on computing a talker-independent representation of each utterance on its own; the second, contextual tuning, is based on learning the vocal characteristics of the talker. Structural estimation requires more attention and effort than contextual tuning. The final project examined the attentional demands of synthetic speech and how they change with perceptual learning. The results demonstrated that the locus of attentional demands in perception of synthetic speech is in recognition rather than storage or recall of synthetic speech. Moreover, perceptual learning increases the efficiency with which listeners can use spare capacity in recognizing synthetic speech and this effect is not just due to increased intelligibility. GRA

N90-10540# Advanced Decision Systems, Mountain View, CA.
TRACKING PERFORMANCE EVALUATION Final Report, 1 Dec. 1987 - 31 Aug. 1988
SHOZO MORI, KUO-CHU CHANG, CHEE-YEE CHONG, and STEVE SPAIN 7 Dec. 1988 76 p Prepared in cooperation with Massachusetts Inst. of Technology, Lexington
(Contract F19628-85-C-0002)
(AD-A210499; ESD-TR-89-128; ADS-TR-1196-1) Avail: NTIS HC A05/MF A01 CSCL 05/6

The research conducted at Advanced Decision Systems, sponsored by Lincoln Laboratory, Massachusetts Institute of Technology, under a project entitled, Discrimination Architecture Engineering Support, from 1 December 1987 to 31 August 1988, is documented. Simple analytic models were developed for predicting performance of tracking systems in terms of track purity under given tracking environments, in particular, multilayer ballistic missile defense environments concerning tracking-surveillance and object -discrimination. The main result is a simple analytic model which relates single-scan track-to-measurement association (correlation) performance to two key parameters, object density on sensors' focal planes, and average measurement prediction accuracy by tracks. Predicted track purity is then calculated, through this model, based on given object trajectories and sensor deployment patterns. Extended models were developed to account for false alarms and merged measurements (CSOs) due to limited sensor resolution. Small-scaled but fairly extensive Monte Carlo simulations support the analytic models for predicting track purity developed through this project. GRA

N90-11441*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
TECHNIQUES FOR OPTIMIZING HUMAN-MACHINE INFORMATION TRANSFER RELATED TO REAL-TIME INTERACTIVE DISPLAY SYSTEMS
MICHAEL M. GRANAAS and DONALD C. RHEA Jan. 1989

16 p Presented at the 27th AIAA Aerospace Sciences Meeting, Reno, NV, 9-12 Jan. 1989 Previously announced as N89-24599
(NASA-TM-100450; H-1506; NAS 1.15:100450; AIAA-89-0151)
Avail: NTIS HC A03/MF A01 CSCL 05/9

In recent years the needs of ground-based researcher-analysts to access real-time engineering data in the form of processed information has expanded rapidly. Fortunately, the capacity to deliver that information has also expanded. The development of advanced display systems is essential to the success of a research test activity. Those developed at the National Aeronautics and Space Administration (NASA), Western Aeronautical Test Range (WATR), range from simple alphanumerics to interactive mapping and graphics. These unique display systems are designed not only to meet basic information display requirements of the user, but also to take advantage of techniques for optimizing information display. Future ground-based display systems will rely heavily not only on new technologies, but also on interaction with the human user and the associated productivity with that interaction. The psychological abilities and limitations of the user will become even more important in defining the difference between a usable and a useful display system. This paper reviews the requirements for development of real-time displays; the psychological aspects of design such as the layout, color selection, real-time response rate, and interactivity of displays; and an analysis of some existing WATR displays. Author

N90-11442# Case Western Reserve Univ., Cleveland, OH. Dept. of Psychology.
COMPREHENSION PROCESSES IN MECHANICAL REASONING Final Report, 1 Jun. 1985 - 31 May 1988
PATRICIA A. CARPENTER and MARCEL A. JUST May 1989 16 p
(Contract N00014-85-K-0584)
(AD-A210459; ONR-89-1) Avail: NTIS HC A03/MF A01 CSCL 05/8

Several lines of research investigated how people reason about mechanical devices. One avenue explored the use of diagrams in conjunction with texts to understand a particular machine. Another project investigated the psychological processes that distinguish people who score high or low in a psychometric test of mechanical ability. A third project examined the visual scanning and decision processes that are used to evaluate a kinematic display of a machine in motion. A fourth project was a simulation model of how a person might generate the kinematic imagery to represent a machine in motion. A fifth project examined the cognitive processes in a visually-based test of pure reasoning (Raven Progressive Matrices). A sixth project examined the use of kinematic computer displays in understanding a complex device. These projects together provide an overview of the psychological processes used in mechanical comprehension, as well as indicating why some people are better at mechanical comprehension than others. GRA

N90-11443# Auburn Univ., AL. Dept. of Health and Human Performance.
STIMULUS-RESPONSE COMPATIBILITY IN SPATIAL PRECUING AND SYMBOLIC IDENTIFICATION: EFFECTS OF CODING PRACTICE, RETENTION, AND TRANSFER Final Report, 1 Oct. 1987 - 31 Mar. 1989
ROBERT W. PROCTOR (Purdue Univ., West Lafayette, IN.) and T. GILMOUR REEVE 31 May 1989 111 p
(Contract AF-AFOSR-0002-88; AF PROJ. 2313)
(AD-A210745; AFOSR-89-0810TR) Avail: NTIS HC A06/MF A01 CSCL 05/8

Research on stimulus-response compatibility effects is reviewed, with an integrated theoretical perspective provided that stresses mental coding of the stimulus and response sets. Eleven experiments, plus two follow-up experiments, are described in detail. The first six evaluate the nature of the codings used in spatial-precuing tasks. The remaining seven experiments examine the influence of practice on performance in the spatial-precuing tasks, as well as in symbolic-compatibility tasks. The experiments show that the codings used by subjects are affected by manipulations of the stimulus set but not of the response set. Compatibility effects within both tasks are reduced greatly by three sessions of practice. Transfer of these benefits to related tasks occurs in situations for which the response set is not altered. However, after more extended practice, partial transfer occurs even when the response set is changed. The results are interpreted in terms of an account that emphasizes salient-feature codings in a declarative stage of skill acquisition, with task-specific procedures acquired from practice. GRA

N90-11444# Naval Air Development Center, Warminster, PA. Air Vehicle and Crew Systems Technology Dept.
FILLING OR OUTLINING SHAPES WITH COLOR: THE EFFECTS ON A VISUAL SEARCH TASK Final Report
DAVID COHEN Aug. 1988 18 p
(AD-A211067; NADC-89004-60) Avail: NTIS HC A03/MF A01 CSCL 06/4

Simplified tactical situation plots were created with shape symbology (i.e., ship, aircraft, submarine, unknown) outlined or filled with color to represent affiliation. Task times were recorded for subjects to identify quadrants which contained the greatest number of a specified target (e.g., hostile submarines, unknown aircraft, etc.) in each condition. Results confirmed that subjects' task times were significantly less in the color-filled condition. An explanation for the effect, how the search worked, and implications for coding tactical displays are discussed. GRA

54

MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

A90-10262
THE USE OF GRAPHS IN THE ERGONOMIC EVALUATION OF TALL PILOTS' SITTING POSTURE
J. J. D. DE REE (KLM Royal Dutch Airlines, Schiphol Airport, Netherlands) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 60, Oct. 1989, Section I, p. 1011-1015. refs
Copyright

A survey has shown that the average heights of KLM pilots has increased by 18 mm per decade in the last 20 years. Around 6 percent are taller than 1905 mm, the upper limit of pilot height for flight deck design. With the use of graphs of the flight deck, it was established that the main problem of tall pilots is insufficient legroom. Of all KLM/NLM aircraft types, the Boeing 747-200/300 and the Douglas DC-9 are most uncomfortable for pilots taller than 1960 mm. In the Airbus A310, pilots of 2000 mm have insufficient legroom. The other aircraft types do not present difficulties for pilots up to 2030 mm. Ergonomic adaptations on the flight decks of the Boeing 747-200/300 and the Airbus A310 are necessary to alleviate the problems of tall pilots. Future aircraft types should be designed to accommodate tall pilots. If ergonomic adaptation of the flight deck is impossible, anthropometric limits for pilot selection have to be employed. Author

A90-10275
SPH-4 U.S. ARMY FLIGHT HELMET PERFORMANCE, 1972-1983
THOMAS E. READING, JOSEPH L. HALEY, JR., ARTHUR C. SIPPO, JOSEPH R. LICINA, and AARON W. SCHOPPER (U.S. Army, Aeromedical Research Laboratory, Fort Rucker, AL) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 60, Oct. 1989, Section II, p. B110-B120. refs
Copyright

Injury data were obtained from the U.S. Army Safety Center for the occupants of U.S. Army aircraft who were both wearing aviator helmets and involved in duty-related aircraft accidents, for

the period beginning on January 1, 1972 and ending January 1, 1983. The injury data were correlated with the physical condition of the involved helmets, examined under an Aviation Life Support Equipment Retrieval Program. Each helmet's performance was evaluated with regard to current injury prevention capabilities and potential improvements for future helmet design. For consistency, only the 208 SPH-4s in the data base were fully analyzed. Combat damaged helmets were excluded from this analysis. Author

A90-10357
TELEOPERATION AND AUTONOMY IN SPACE STATION ROBOTIC SYSTEMS
PAUL D. CAMPBELL (Rockwell International Corp., Space Transportation Systems Div., Houston, TX) IN: Space Station automation IV; Proceedings of the Meeting, Cambridge, MA, Nov. 7-9, 1988. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1988, p. 56-62.
Copyright

The control methods and corresponding crew interfaces for robotic systems in conjunction with crewmember extravehicular activity (EVA) in the U.S. Space Station planned for on-orbit assembly in the 1990's are investigated. Both teleoperation and autonomous operation are being pursued to provide either low-level control or high-level supervision of robotic tasks. The Flight Telerobotic Servicer (FTS) will be teleoperated to perform a variety of assembly, maintenance, and servicing tasks, while the EVA retriever is a free-flying autonomous robot designed for retrieval of a drifting crewmember or piece of equipment inadvertently detached from the Station. Teleoperation and autonomy are the ends of a spectrum of possible control modes. For a design selection along this dimension as well as safety considerations, the complexity of the robotic task must be considered together with the technologies required to support either teleoperation or autonomous performance of the task. Space Station operations will be enhanced by optimization of each robot's control method with respect to its mission. C.E.

A90-10358
TASK DECOMPOSITION MODULE FOR TELEROBOT TRAJECTORY GENERATION
ALBERT J. WAVERING and RON LUMIA (NIST, Robot Systems Div., Gaithersburg, MD) IN: Space Station automation IV; Proceedings of the Meeting, Cambridge, MA, Nov. 7-9, 1988. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1988, p. 63-70. refs
Copyright

A task decomposition module which plans and executes manipulator trajectories for a manipulator controlled by a hierarchical control system is described. The module consists of three concurrently executing submodules which manage the input command queue and coordinate operator interaction, plan trajectory functions or motion profiles, and execute planned trajectories while evaluating sensor and other world model information. An interface is suggested for the module which allows the specification of a number types of motions in a time-independent manner. Finally, some examples illustrating how different types of trajectory generation techniques are accommodated by the module structure and interfaces are presented. C.E.

A90-10359
TASK PLANNING ISSUES FOR AN IN-ORBIT SERVICE MANIPULATOR
RICHARD E. SMITH (FMC Advanced Systems Center, Minneapolis, MN) IN: Space Station automation IV; Proceedings of the Meeting, Cambridge, MA, Nov. 7-9, 1988. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1988, p. 71-78. Research supported by ESA. refs
Copyright

Goals and concerns surrounding the development of intelligent robotics software for the Service Manipulator System (SMS) being developed for the European Space Agency are discussed. The principal goal of the SMS task software is to automate the mundane details of operating the manipulator as much as possible. The astronaut or other operator would only need to identify a task and the SMS would automatically plan and execute the appropriate motions and grasping operations needed to carry it out. The technical problems underlying these activities have been studied closely by robotics researchers; the effectiveness of available techniques often depends on the complexity of the in-orbit service environment. Reliability and testability requirements as well as uncertainties introduced in component geometries by the stress of launch and deployment are also important. These problems are currently being explored through software experiments and the development of an intelligent robotic testbed. C.E.

A90-10365* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
NASA TELEROBOT TESTBED DEVELOPMENT AND CORE TECHNOLOGY DEMONSTRATION
PAUL S. SCHENKER, ROBERT L. FRENCH, and DAVID B. SMITH (California Institute of Technology, Jet Propulsion Laboratory, Pasadena) IN: Space Station automation IV; Proceedings of the Meeting, Cambridge, MA, Nov. 7-9, 1988. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1988, p. 132-150. refs
Copyright

In 1985, NASA initiated a major program of technology development and demonstration for robotics applications to space servicing, assembly, repair, and remote exploration. A ground-based telerobot testbed at the Jet Propulsion Laboratory has been the focal point within this program. Designed to prove technology concepts for supervised automation of increasingly unstructured and complex tasks, the testbed has reached an initial stage of integration. Several significant testbed experiments have been performed, including visual tracking and grapple of a satellite, dual-arm spatial coordination and manipulator control, force-reflecting teleoperations, and simulated task planning for a satellite servicing scenario. The current NASA plans for continuing testbed development and demonstration are also described. C.E.

A90-10366
TELE-PERCEPTION
FRANCIS QUEK, RAMESH JAIN (Michigan, University, Ann Arbor), and BRIAN MITCHELL (Michigan, Environmental Research Institute, Ann Arbor) IN: Space Station automation IV; Proceedings of the Meeting, Cambridge, MA, Nov. 7-9, 1988. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1988, p. 152-162. refs
Copyright

A concept called tele-perception has been developed by the NASA Center for Autonomous and Man-Controlled Robotics and Sensing Systems (CAMRSS). The tele-perception concept deals with various computer perception and human interface problems; according to this concept the distinction between computer perception and human perception need not be absolute. Tele-perception is the technology of man-machine interaction which permits the augmentation of machine perception technique with the considerable intangibilities of human cognition and which exploits the facility of machine perception to handle vast amounts of data to distill and enhance information for selective presentation to human agents. The paper illustrates the tele-perception concept along with all related projects undertaken at the CAMRSS laboratories. C.E.

A90-11090
EMERGENCY OXYGEN FOR TACTICAL AIRCRAFT
STEVEN N. ULOSEVICH (USAF, Hickam AFB, HI) and JOHN B. BOMAR, JR. (USAF, School of Aerospace Medicine, Brooks AFB, TX) SAFE Journal, vol. 19, Fall 1989, p. 13-18.
Copyright

The need for an improved emergency oxygen system for USAF tactical aircraft is discussed. The capabilities and performance of the current emergency bail-out oxygen system are examined. Examples of actual emergencies which have occurred are presented. A new regulated emergency oxygen system (REOS)

for tactical fighter aircraft is proposed and the design of the pull-off connector and regulator system for the REOS are described. The main feature of the REOS is the emergency oxygen is supplied via a demand regulator mounted on the seat. Also the REOS is very adaptable and expandable. I.F.

A90-11091* Krug International, San Antonio, TX.
DETERMINING A BENDS-PREVENTING PRESSURE FOR A SPACE SUIT
R. W. KRUTZ, JR., J. T. WEBB (Krug International, Technology Services Div., San Antonio, TX), and G. A. DIXON (USAF, School of Aerospace Medicine, Brooks AFB, TX) SAFE Journal, vol. 19, Fall 1989, p. 20-24. Research sponsored by USAF. refs
(Contract NASA ORDER T-82170)
Copyright

Research conducted to determine the proper pressure for preventing bends during EVA without preoxygenation is examined. Male and female subjects with different breathing gas mixtures and pressures are studied in order to define the pressure. Visual and auditory Doppler ultrasonic signals are utilized to monitor intravascular gas bubbles. The workload, which simulates EVA, consists of a handturned bicycle ergometer, a torque wrench operation, and a rope pull. The experimental data reveal that the minimum space suit pressure needed to prevent decompression sickness is 9.5 psi. I.F.

A90-11092
SECONDARY OXYGEN PURIFIER FOR MOLECULAR SIEVE OXYGEN CONCENTRATOR
GEORGE W. MILLER and CLARENCE F. THEIS (USAF, School of Aerospace Medicine, Brooks AFB, TX) SAFE Journal, vol. 19, Fall 1989, p. 27-32.
Copyright

The use of a secondary oxygen purifier to purify the oxygen is examined. The adsorption of various zeolite molecular sieves and a carbon molecular sieve are analyzed using adsorption breakthrough studied. It is observed that the carbon-based adsorbent has a selectivity for argon over oxygen. A secondary oxygen purifier is designed using this adsorbent and the performance of the purifier is evaluated. The data reveal that at 30 psia inlet pressure, 5 sec cycle time, and exhaust pressure of 14.4 psia the purifier generates a gas with a 99.65 pct oxygen concentration. I.F.

A90-11093
THE APPLICATION OF ANTHROPOMETRIC DATA TO THE SIZING OF AIRCREW PRESSURE PROTECTIVE G-GARMENTS
W. R. SCOTT and R. E. SIMPSON (Krug International, Technology Services Div., San Antonio, TX) SAFE Journal, vol. 19, Fall 1989, p. 33-40. Research sponsored by USAF. refs
Copyright

In the military aircrew life-support equipment field, emphasis is currently being placed on the enhancement of G protection to meet the increasing demands of high-performance aircraft. Recent advances in G-protective systems have included the combination of lower-body G protection with positive-pressure breathing (PPB) and an associated chest counterpressure garment. In such an approach, whether the upper- and lower-body pressure garments are separate or integrated, there is a need for their sizing to reflect accurately the aircrew population. There is also a vital need for these garments to meet the requirements of comfort, mobility, and unpressurized and pressurized bulk control. Satisfying these requirements poses a number of problems, particularly where cost and logistic considerations dictate the economical provisioning of the garments as sized off-the-shelf items. This paper discusses these problems as they relate to the lower- and upper-body G-protective garment assembly. Author

A90-12792
ADVANCED LIFE SUPPORT IN LUNAR AND MARS MISSIONS
Aerospace Engineering (ISSN 0736-2536), vol. 9, Oct. 1989, p. 23-27.
Copyright

The technology-development requirements that must be addressed in order to allow extensive lunar and Martian manned exploration encompass closed-loop life support systems, EVA, surface transportation systems, long-duration medical support, physiological deconditioning and psychological environments, and reliability enhancement. Lunar scenarios stressing science will probably emphasize long-range mobility, requiring pressurized mobile systems able to furnish life support for crews and to support telerobotic apparatus. Early Mars exploration would by contrast stress limited EVA. O.C.

N90-10541# Army Research Inst. of Environmental Medicine, Natick, MA. Military Ergonomics Div.
THERMOREGULATORY RESPONSES TO INTERMITTENT EXERCISE ARE INFLUENCED BY KNIT STRUCTURE OF UNDERWEAR
RUTH NIELSEN (National Inst. of Occupational Health, Solna, Sweden) and THOMAS L. ENDRUSICK Apr. 1989 26 p
(AD-A209087; USARIEM-M-34-189) Avail: NTIS HC A03/MF A01 CSCL 06/10

The purpose of this study was to evaluate the role of knit structure in underwear on thermoregulatory responses. Underwear manufactured from 100 percent polypropylene fibers in five different knit structures (1-by-1 rib, fleece, fishnet, interlock, double-layer rib) were evaluated. All five year underwear prototypes were tested as part of a prototype clothing system. Measured on a thermal manikin these clothing systems had total thermal resistances, I(tot), of 0.243, 0.268, 0.256. 0.248 and 0.250 square meter/k/w, respectively. Human testing was done on eight male subjects and took place at T(a) = 5 C, t(sp) = 3.5 c and V(a) = 0.32 m/s. The test comprised a repeated bout of 40 min cycle exercise (315 w/square meter; 52 + or - 4.9 percent maximum oxygen consumption followed by 20 min of rest (w/sqi M). VO2, heart rate, esophageal temperature, local skin temperatures, ambient air temperature, dew point temperature at three skin sites and in the ambient air were monitored. Onset of sweating was evaluated from the dew point sensor recordings. The differences in knit structure of the underwater in the clothing systems resulted in significant differences in mean skin temperature, local and average skin wetness, non-evaporated and evaporated sweat during the course of the core temperature. GRA

N90-10542*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
VISION SCIENCE AND TECHNOLOGY AT NASA: RESULTS OF A WORKSHOP
ANDREW B. WATSON, ed. and JEFFREY B. MULLIGAN, ed. Aug. 1989 62 p Workshop held at Moffett Field, CA, 30 Nov. - 2 Dec. 1988
(NASA-TM-102214; A-89211; NAS 1.15:102214) Avail: NTIS HC A04/MF A01 CSCL 05/8

A broad review is given of vision science and technology within NASA. The subject is defined and its applications in both NASA and the nation at large are noted. A survey of current NASA efforts is given, noting strengths and weaknesses of the NASA program.

N90-10543*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
VISION SCIENCE AND TECHNOLOGY AT NASA: RESULTS OF A WORKSHOP: EXECUTIVE SUMMARY
In its Vision Science and Technology at NASA: Results of a Workshop p 3-17 Aug. 1989
Avail: NTIS HC A04/MF A01 CSCL 05/8

Through Vision Science and Technology (VST), researchers seek to understand the process of vision at the biological, physical, and mathematical levels, and to translate that understanding into practical advances in human factors, visual displays, image processing, and autonomous vision. VST is an important element of many national initiatives in science and engineering, such as High-Definition Television, Human Genome Project, Superconducting Super Collider, and Strategic Defense Initiative, as well as in the efforts to revitalize American industry through

increased automation. The NASA effort in VST is of high quality, but the level of effort is insufficient to meet the requirements of future NASA missions. The NASA program in VST could be strengthened sufficiently to meet these future challenges. Steps in this direction should include: explicitly acknowledging VST in planning and funding; enhancing the complement of in-house researchers; encouraging selective excellence in a small number of VST areas; establishing an in-house center of excellence in VST; encouraging collaboration with universities and among centers; and adopting a long-term emphasis on fundamental work in VST to support future applications. Author

N90-10544*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
SAMPLING AND NOISE IN VISION NETWORKS Abstract Only
ALBERT J. AHUMADA, JR. *In its* Vision Science and Technology at NASA: Results of a Workshop p 19-20 Aug. 1989
Avail: NTIS HC A04/MF A01 CSCL 05/8

This research is part of the Human Interface Research Branch-Vision Group's program to develop computable models of biological solutions to general vision system problems. Two problem areas are addressed: (1) effects of discrete sampling by receptors, and (2) effects of visual system noise. Author

N90-10545*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
NETWORKS FOR IMAGE ACQUISITION, PROCESSING AND DISPLAY Abstract Only
ALBERT J. AHUMADA, JR. *In its* Vision Science and Technology at NASA: Results of a Workshop p 21 Aug. 1989
Avail: NTIS HC A04/MF A01 CSCL 05/8

The human visual system comprises layers of networks which sample, process, and code images. Understanding these networks is a valuable means of understanding human vision and of designing autonomous vision systems based on network processing. Ames Research Center has an ongoing program to develop computational models of such networks. The models predict human performance in detection of targets and in discrimination of displayed information. In addition, the models are artificial vision systems sharing properties with biological vision that has been tuned by evolution for high performance. Properties include variable density sampling, noise immunity, multi-resolution coding, and fault-tolerance. The research stresses analysis of noise in visual networks, including sampling, photon, and processing unit noises. Specific accomplishments include: models of sampling array growth with variable density and irregularity comparable to that of the retinal cone mosaic; noise models of networks with signal-dependent and independent noise; models of network connection development for preserving spatial registration and interpolation; multi-resolution encoding models based on hexagonal arrays (HOP transform); and mathematical procedures for simplifying analysis of large networks. Author

N90-10548*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
VISION SCIENCE AND TECHNOLOGY FOR SUPERVISED INTELLIGENT SPACE ROBOTS Abstract Only
JON D. ERICKSON *In* NASA. Ames Research Center, Vision Science and Technology at NASA: Results of a Workshop p 24 Aug. 1989
Avail: NTIS HC A04/MF A01 CSCL 05/8

The focus of recent work in robotic vision for application in intelligent space robots such as the Extravehicular Activity (EVA) Retriever is in visual function, that is, how information about the space world is derived and then conveyed to cognition. The goal of this work in visual function is first to understand how the relevant structure of the surrounding world is evidenced by regularities among the pixels of images, then to understand how these regularities are mapped on the premises that form the primitive elements of cognition, and then to apply these understandings with the elements of visual processing (algorithms) and visual mechanism (machine organization) to intelligent space robot simulations and test beds. Since visual perception is the process of recognizing regularities in images that are known on the basis of a model of the world to be reliable related to causal structure in the environment (because perception attaches meaning to the link between a conception of the environment and the objective environment), the work involves understanding generic, generally applicable models of world structure (not merely objects) and how that structure evidences itself in images. Author

N90-10550*# Odetics, Inc., Anaheim, CA.
INTENSITY DEPENDENT SPREAD THEORY Abstract Only
RICHARD HOLBEN *In* NASA. Ames Research Center, Vision Science and Technology at NASA: Results of a Workshop p 27 Aug. 1989
Avail: NTIS HC A04/MF A01 CSCL 05/8

The Intensity Dependent Spread (IDS) procedure is an image-processing technique based on a model of the processing which occurs in the human visual system. IDS processing is relevant to many aspects of machine vision and image processing. For quantum limited images, it produces an ideal trade-off between spatial resolution and noise averaging, performs edge enhancement thus requiring only mean-crossing detection for the subsequent extraction of scene edges, and yields edge responses whose amplitudes are independent of scene illumination, depending only upon the ratio of the reflectance on the two sides of the edge. These properties suggest that the IDS process may provide significant bandwidth reduction while losing only minimal scene information when used as a preprocessor at or near the image plane. Author

N90-10551*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
IMAGE GATHERING, CODING, AND PROCESSING: END-TO-END OPTIMIZATION FOR EFFICIENT AND ROBUST ACQUISITION OF VISUAL INFORMATION Abstract Only
FRIEDRICH O. HUCK and CARL L. FALES *In* NASA. Ames Research Center, Vision Science and Technology at NASA: Results of a Workshop p 28-29 Aug. 1989
Avail: NTIS HC A04/MF A01 CSCL 05/8

Researchers are concerned with the end-to-end performance of image gathering, coding, and processing. The applications range from high-resolution television to vision-based robotics, wherever the resolution, efficiency and robustness of visual information acquisition and processing are critical. For the presentation at this workshop, it is convenient to divide research activities into the following two overlapping areas: The first is the development of focal-plane processing techniques and technology to effectively combine image gathering with coding, with an emphasis on low-level vision processing akin to the retinal processing in human vision. The approach includes the familiar Laplacian pyramid, the new intensity-dependent spatial summation, and parallel sensing/processing networks. Three-dimensional image gathering is attained by combining laser ranging with sensor-array imaging. The second is the rigorous extension of information theory and optimal filtering to visual information acquisition and processing. The goal is to provide a comprehensive methodology for quantitatively assessing the end-to-end performance of image gathering, coding, and processing. Author

N90-10552*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
HYBRID VISION ACTIVITIES AT NASA JOHNSON SPACE CENTER Abstract Only
RICHARD D. JUDAY *In* NASA. Ames Research Center, Vision Science and Technology at NASA: Results of a Workshop p 30 Aug. 1989
Avail: NTIS HC A04/MF A01 CSCL 05/8

NASA's Johnson Space Center in Houston, Texas, is active in several aspects of hybrid image processing. (The term hybrid image processing refers to a system that combines digital and photonic processing). The major thrusts are autonomous space operations such as planetary landing, servicing, and rendezvous and docking. By processing images in non-Cartesian geometries to achieve shift invariance to canonical distortions, researchers

use certain aspects of the human visual system for machine vision. That technology flow is bidirectional; researchers are investigating the possible utility of video-rate coordinate transformations for human low-vision patients. Man-in-the-loop teleoperations are also supported by the use of video-rate image-coordinate transformations, as researchers plan to use bandwidth compression tailored to the varying spatial acuity of the human operator. Technological elements being developed in the program include upgraded spatial light modulators, real-time coordinate transformations in video imagery, synthetic filters that robustly allow estimation of object pose parameters, convolutionally blurred filters that have continuously selectable invariance to such image changes as magnification and rotation, and optimization of optical correlation done with spatial light modulators that have limited range and couple both phase and amplitude in their response. Author

N90-10553*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
HUMAN MOTION PERCEPTION: HIGHER-ORDER ORGANIZATION Abstract Only
MARY K. KAISER and DENNIS R. PROFFITT (Virginia Univ., Charlottesville.) *In its* Vision Science and Technology at NASA: Results of a Workshop p 31-32 Aug. 1989
Avail: NTIS HC A04/MF A01 CSCL 05/8

An overview is given of higher-order motion perception and organization. It is argued that motion is sufficient to fully specify a number of environmental properties, including: depth order, three-dimentional form, object displacement, and dynamics. A grammar of motion perception is proposed; applications of this work for display design are discussed. Author

N90-10554*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
TWO-DIMENSIONAL SHAPE RECOGNITION USING SPARSE DISTRIBUTED MEMORY Abstract Only
PENTTI KANERVA and BRUNO OLSHAUSEN *In its* Vision Science and Technology at NASA: Results of a Workshop p 33 Aug. 1989
Avail: NTIS HC A04/MF A01 CSCL 05/8

Researchers propose a method for recognizing two-dimensional shapes (hand-drawn characters, for example) with an associative memory. The method consists of two stages: first, the image is preprocessed to extract tangents to the contour of the shape; second, the set of tangents is converted to a long bit string for recognition with sparse distributed memory (SDM). SDM provides a simple, massively parallel architecture for an associative memory. Long bit vectors (256 to 1000 bits, for example) serve as both data and addresses to the memory, and patterns are grouped or classified according to similarity in Hamming distance. At the moment, tangents are extracted in a simple manner by progressively blurring the image and then using a Canny-type edge detector (Canny, 1986) to find edges at each stage of blurring. This results in a grid of tangents. While the technique used for obtaining the tangents is at present rather ad hoc, researchers plan to adopt an existing framework for extracting edge orientation information over a variety of resolutions, such as suggested by Watson (1987, 1983), Marr and Hildreth (1980), or Canny (1986). Author

N90-10555*# Odetics, Inc., Anaheim, CA.
THE INTENSITY DEPENDENT SPREAD MODEL AND COLOR CONSTANCY Abstract Only
ELLIE KURRASCH *In* NASA. Ames Research Center, Vision Science and Technology at NASA: Results of a Workshop p 34 Aug. 1989
Avail: NTIS HC A04/MF A01 CSCL 05/8

Odetics is investigating the use of the intensity dependent spread (IDS) model for determining color constancy. Object segmentation is performed effortlessly by the human visual systems, but creating computer vision that takes an image as input and performs object identification on the basis of color has some difficulties. The unknown aspects of the light illuminating a scene in space or anywhere can seriously interfere with the use of color for object identification. The color of an image depends not only on the physical characteristics of the object, but also on the wavelength composition of the incident illumination. IDS processing provides the extraction of edges and of reflectance changes across edges, independent of variations in scene illumination. IDS depends solely on the ratio of the reflectances on the two sides of the edge. Researchers are in the process of using IDS to recover the reflectance image. Author

N90-10556*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
FILLING IN THE RETINAL IMAGE Abstract Only
JAMES LARIMER and THOMAS PIANTANIDA (SRI International Corp., Menlo Park, CA.) *In its* Vision Science and Technology at NASA: Results of a Workshop p 35 Aug. 1989
Avail: NTIS HC A04/MF A01 CSCL 05/8

The optics of the eye form an image on a surface at the back of the eyeball called the retina. The retina contains the photoreceptors that sample the image and convert it into a neural signal. The spacing of the photoreceptors in the retina is not uniform and varies with retinal locus. The central retinal field, called the macula, is densely packed with photoreceptors. The packing density falls off rapidly as a function of retinal eccentricity with respect to the macular region and there are regions in which there are no photoreceptors at all. The retinal regions without photoreceptors are called blind spots or scotomas. The neural transformations which convert retinal image signals into percepts fills in the gaps and regularizes the inhomogeneities of the retinal photoreceptor sampling mosaic. The filling-in mechamism plays an important role in understanding visual performance. The filling-in mechanism is not well understood. A systematic collaborative research program at the Ames Research Center and SRI in Menlo Park, California, was designed to explore this mechanism. It was shown that the perceived fields which are in fact different from the image on the retina due to filling-in, control some aspects of performance and not others. Researchers have linked these mechanisms tc putative mechanisms of color coding and color constancy. Author

N90-10557*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
A3I VISIBILITY MODELING PROJECT Abstract Only
JAMES LARIMER, ARIES ARDITI, JAMES BERGEN, and NORMAN BADLER (Pennsylvania Univ., Philadelphia.) *In its* Vision Science and Technology at NASA: Results of a Workshop p 36 Aug. 1989
Avail: NTIS HC A04/MF A01 CSCL 05/8

The Army-NASA Aircrew Aircraft Integration program is supporting a joint project to build a visibility computer-aided design (CAD) tool. CAD has become an essential tool in modern engineering applications. CAD tools are used to create engineering drawings and to evaluate potential designs before they are physically realized. The visibility CAD tool will provide the design engineer with a tool to aid in the location and specification of windows, displays, and control in crewstations. In an aircraft cockpit the location of instruments and the emissive and reflective characteristics of the surfaces must be determined to assure adequate aircrew performance. The visibility CAD tool will allow the designer to ask and answer many of these questions in the context of a three-dimensional graphical representation of the cockpit. The graphic representation of the cockpit is a geometrically valid model of the cockpit design. A graphic model of a pilot, called the pilot manikin, can be placed naturalistically in the cockpit model. The visibility tool has the capability of mapping the cockpit surfaces and other objects modeled in this graphic design space onto the simulated pilot's retinas for a given visual fixation. Author

N90-10558*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
MOTION DETECTION IN ASTRONOMICAL AND ICE FLOE IMAGES Abstract Only
M. MANOHAR, H. K. RAMAPRIYAN, and J. P. STRONG *In*

NASA. Ames Research Center, Vision Science and Technology at NASA: Results of a Workshop p 37 Aug. 1989
Avail: NTIS HC A04/MF A01 CSCL 05/8

Two approaches are presented for establishing correspondence between small areas in pairs of successive images for motion detection. The first one, based on local correlation, is used on a pair of successive Voyager images of the Jupiter which differ mainly in locally variable translations. This algorithm is implemented on a sequential machine (VAX 780) as well as the Massively Parallel Processor (MPP). In the case of the sequential algorithm, the pixel correspondence or match is computed on a sparse grid of points using nonoverlapping windows (typically 11 x 11) by local correlations over a predetermined search area. The displacement of the corresponding pixels in the two images is called the disparitries to cubic surfaces. The disparities at points where the error between the computed values and the surface values exceeds a particular threshold are replaced by the surface values. A bilinear interpolation is then used to estimate disparities at all other pixels between the grid points. When this algorithm was applied at the red spot in the Jupiter image, the rotating velocity field of the storm was determined. The second method of motion detection is applicable to pairs of images in which corresponding areas can experience considerable translation as well as rotation. Author

N90-10559*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
FACTORS AFFECTING THE PERCEPTION OF TRANSPARENT MOTION Abstract Only
JEFFREY B. MULLIGAN *In its* Vision Science and Technology at NASA: Results of a Workshop p 38 Aug. 1989
Avail: NTIS HC A04/MF A01 CSCL 05/8

It is possible to create a perception of transparency by combining patterns having different motions. Two particular combination rules, have specific interpretations in terms of physical phenomena: additive (specular reflection) and multiplicative (shadow illumination). Arbitrary combination rules applied to random patterns generate percepts in which the motions of the two patterns are visible, but have super-imposed noise. It is also possible to combine the patterns (using an exclusive-OR rule) so that only noise is visible. Within a one-dimensional family of combination rules which include addition and multiplication, there is a range where smooth motions are seen with no superimposed noise; this range is centered about the additive combination. This result suggests that the motion system deals with a linear representation of luminance, and is consistent with the analysis of motion by linear sensors. This research gives tentative validation the use in beam splitters (which combine images additively) in the construction of heads-up aviation displays. Further work is needed to determine if the superiority of additive combination generalizes to the case of full-color imagery (there are results in the literature suggesting that subtractive color mixture yields the best legibility of overlapping alphanumerics). Author

N90-10560*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
PHOTONIC PROCESSING AT NASA AMES RESEARCH CENTER Abstract Only
ELLEN OCHOA and MAX REID *In its* Vision Science and Technology at NASA: Results of a Workshop p 39 Aug. 1989
Avail: NTIS HC A04/MF A01 CSCL 05/8

The Photonic Processing group is engaged in applied research on optical processors in support of the Ames vision to lead the development of autonomous intelligent systems. Optical processors, in conjunction with numeric and symbolic processors, are needed to provide the powerful processing capability that is required for many future agency missions. The research program emphasizes application of analog optical processing, where free-space propagation between components allows natural implementations of algorithms requiring a large degree of parallel computation. Special consideration is given in the Ames program to the integration of optical processors into larger, heterogeneous computational systems. Demonstration of the effective integration of optical processors within a broader knowledge-based system is essential to evaluate their potential for dependable operation in an autonomous environment such as space. The Ames Photonics program is currently addressing several areas of interest. One of the efforts is to develop an optical correlator system with two programmable spatial light modulators (SLMs) to perform distortion invariant pattern recognition. Another area of research is optical neural networks, also for use in distortion-invariant pattern recognition. Author

N90-10561*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
SPARSE DISTRIBUTED MEMORY OVERVIEW Abstract Only
MIKE RAUGH *In its* Vision Science and Technology at NASA: Results of a Workshop p 40-41 Aug. 1989
Avail: NTIS HC A04/MF A01 CSCL 05/8

The Sparse Distributed Memory (SDM) project is investigating the theory and applications of massively parallel computing architecture, called sparse distributed memory, that will support the storage and retrieval of sensory and motor patterns characteristic of autonomous systems. The immediate objectives of the project are centered in studies of the memory itself and in the use of the memory to solve problems in speech, vision, and robotics. Investigation of methods for encoding sensory data is an important part of the research. Examples of NASA missions that may benefit from this work are Space Station, planetary rovers, and solar exploration. Sparse distributed memory offers promising technology for systems that must learn through experience and be capable of adapting to new circumstances, and for operating any large complex system requiring automatic monitoring and control. Sparse distributed memory is a massively parallel architecture motivated by efforts to understand how the human brain works. Sparse distributed memory is an associative memory, able to retrieve information from cues that only partially match patterns stored in the memory. It is able to store long temporal sequences derived from the behavior of a complex system, such as progressive records of the system's sensory data and correlated records of the system's motor controls. Author

N90-10562*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ALGORITHMS AND ARCHITECTURES FOR ROBOT VISION Abstract Only
PAUL S. SCHENKER *In* NASA. Ames Research Center, Vision Science and Technology at NASA: Results of a Workshop p 42-43 Aug. 1989
Avail: NTIS HC A04/MF A01 CSCL 05/8

The scope of the current work is to develop practical sensing implementations for robots operating in complex, partially unstructured environments. A focus in this work is to develop object models and estimation techniques which are specific to requirements of robot locomation, approach and avoidance, and grasp and minipulation. Such problems have to date received limited attention in either computer or human vision - in essence, asking not only how perception is in general modeled, but also what is the functional purpose of its underlying representations. As in the past, researchers are drawing on ideas from both the psychological and machine vision literature. Of particular interest is the development 3-D shape and motion estimates for complex objects when given only partial and uncertain information and when such information is incrementally accrued over time. Current studies consider the use of surface motion, contour, and texture information, with the longer range goal of developing a fused sensing strategy based on these sources and others. Author

N90-10563*# California Univ., Berkeley. Telerobotics Unit.
INSTRUMENTATION AND ROBOTIC IMAGE PROCESSING USING TOP-DOWN MODEL CONTROL Abstract Only
LAWRENCE STARK, BARBARA MILLS, AN H. NGUYEN, and HUY X. NGO *In* NASA. Ames Research Center, Vision Science and Technology at NASA: Results of a Workshop p 44 Aug. 1989
Avail: NTIS HC A04/MF A01 CSCL 05/8

A top-down image processing scheme is described. A three-dimensional model of a robotic working environment, with

robot manipulators, workpieces, cameras, and on-the-scene visual enhancements is employed to control and direct the image processing, so that rapid, robust algorithms act in an efficient manner to continually update the model. Only the model parameters are communicated, so that savings in bandwidth are achieved. This image compression by modeling is especially important for control of space telerobotics. The background for this scheme lies in an hypothesis of human vision put forward by the senior author and colleagues almost 20 years ago - the Scanpath Theory. Evidence was obtained that repetitive sequences of saccadic eye movements, the scanpath, acted as the checking phase of visual pattern recognition. Further evidence was obtained that the scanpaths were apparently generated by a cognitive model and not directly by the visual image. This top-down theory of human vision was generalized in some sense to the frame in artificial intelligence. Another source of the concept arose from bioengineering instrumentation for measuring the pupil and eye movements with infrared video cameras and special-purpose hardware. Author

N90-10564*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
COMPUTER VISION RESEARCH AT MARSHALL SPACE FLIGHT CENTER Abstract Only
FRANK L. VINZ *In* NASA. Ames Research Center, Vision Science and Technology at NASA: Results of a Workshop p 45 Aug. 1989
Avail: NTIS HC A04/MF A01 CSCL 05/8

Orbital docking, inspection, and sevicing are operations which have the potential for capability enhancement as well as cost reduction for space operations by the application of computer vision technology. Research at MSFC has been a natural outgrowth of orbital docking simulations for remote manually controlled vehicles such as the Teleoperator Retrieval System and the Orbital Maneuvering Vehicle (OMV). Baseline design of the OMV dictates teleoperator control from a ground station. This necessitates a high data-rate communication network and results in several seconds of time delay. Operational costs and vehicle control difficulties could be alleviated by an autonomous or semi-autonomous control system onboard the OMV which would be based on a computer vision system having capability to recognize video images in real time. A concept under development at MSFC with these attributes is based on syntactic pattern recognition. It uses tree graphs for rapid recognition of binary images of known orbiting target vehicles. This technique and others being investigated at MSFC will be evaluated in realistic conditions by the use of MSFC orbital docking simulators. Computer vision is also being applied at MSFC as part of the supporting development for Work Package One of Space Station Freedom. Author

N90-10565*# Stanford Univ., CA.
STANFORD/NASA-AMES CENTER OF EXCELLENCE IN MODEL-BASED HUMAN PERFORMANCE Abstract Only
BRIAN A. WANDELL *In* NASA. Ames Research Center, Vision Science and Technology at NASA: Results of a Workshop p 46 Aug. 1989
Avail: NTIS HC A04/MF A01 CSCL 05/8

The human operator plays a critical role in many aeronautic and astronautic missions. The Stanford/NASA-Ames Center of Excellence in Model-Based Human Performance (COE) was initiated in 1985 to further our understanding of the performance capabilities and performance limits of the human component of aeronautic and astronautic projects. Support from the COE is devoted to those areas of experimental and theoretical work designed to summarize and explain human performance by developing computable performance models. The ultimate goal is to make these computable models available to other scientists for use in design and evaluation of aeronautic and astronautic instrumentation. Within vision science, two topics have received particular attention. First, researchers did extensive work analyzing the human ability to recognize object color relatively independent of the spectral power distribution of the ambient lighting (color constancy). The COE has supported a number of research papers in this area, as well as the development of a substantial data base of surface reflectance functions, ambient illumination functions, and an associated software package for rendering and analyzing image data with respect to these spectral functions. Second, the COE supported new empirical studies on the problem of selecting colors for visual display equipment to enhance human performance in discrimination and recognition tasks. Author

N90-10566*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
AMES VISION GROUP RESEARCH OVERVIEW Abstract Only
ANDREW B. WATSON *In its* Vision Science and Technology at NASA: Results of a Workshop p 47 Aug. 1989
Avail: NTIS HC A04/MF A01 CSCL 05/8

A major goal of the reseach group is to develop mathematical and computational models of early human vision. These models are valuable in the prediction of human performance, in the design of visual coding schemes and displays, and in robotic vision. To date researchers have models of retinal sampling, spatial processing in visual cortex, contrast sensitivity, and motion processing. Based on their models of early human vision, researchers developed several schemes for efficient coding and compression of monochrome and color images. These are pyramid schemes that decompose the image into features that vary in location, size, orientation, and phase. To determine the perceptual fidelity of these codes, researchers developed novel human testing methods that have received considerable attention in the research community. Researchers constructed models of human visual motion processing based on physiological and psychophysical data, and have tested these models through simulation and human experiments. They also explored the application of these biological algorithms to applications in automated guidance of rotorcraft and autonomous landing of spacecraft. Researchers developed networks for inhomogeneous image sampling, for pyramid coding of images, for automatic geometrical correction of disordered samples, and for removal of motion artifacts from unstable cameras. Author

N90-10567*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
PYRAMID IMAGE CODES Abstract Only
ANDREW B. WATSON *In its* Vision Science and Technology at NASA: Results of a Workshop p 48 Aug. 1989
Avail: NTIS HC A04/MF A01 CSCL 05/8

All vision systems, both human and machine, transform the spatial image into a coded representation. Particular codes may be optimized for efficiency or to extract useful image features. Researchers explored image codes based on primary visual cortex in man and other primates. Understanding these codes will advance the art in image coding, autonomous vision, and computational human factors. In cortex, imagery is coded by features that vary in size, orientation, and position. Researchers have devised a mathematical model of this transformation, called the Hexagonal oriented Orthogonal quadrature Pyramid (HOP). In a pyramid code, features are segregated by size into layers, with fewer features in the layers devoted to large features. Pyramid schemes provide scale invariance, and are useful for coarse-to-fine searching and for progressive transmission of images. The HOP Pyramid is novel in three respects: (1) it uses a hexagonal pixel lattice, (2) it uses oriented features, and (3) it accurately models most of the prominent aspects of primary visual cortex. The transform uses seven basic features (kernels), which may be regarded as three oriented edges, three oriented bars, and one non-oriented blob. Application of these kernels to non-overlapping seven-pixel neighborhoods yields six oriented, high-pass pyramid layers, and one low-pass (blob) layer. Author

N90-10569*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
SPACE ENVIRONMENT ROBOT VISION SYSTEM Abstract Only
H. JOHN WOOD and WILLIAM L. EICHHORN *In* NASA. Ames

Research Center, Vision Science and Technology at NASA: Results of a Workshop p 50 Aug. 1989
Avail: NTIS HC A04/MF A01 CSCL 05/8

A prototype twin-camera stereo vision system for autonomous robots has been developed at Goddard Space Flight Center. Standard charge coupled device (CCD) imagers are interfaced with commercial frame buffers and direct memory access to a computer. The overlapping portions of the images are analyzed using photogrammetric techniques to obtain information about the position and orientation of objects in the scene. The camera head consists of two 510 x 492 x 8-bit CCD cameras mounted on individually adjustable mounts. The 16-mm efl lenses are designed for minimum geometric distortion. The cameras can be rotated in the pitch, roll, and yaw (pan angle) directions with respect to their optical axes. Calibration routines have been developed which automatically determine the lens focal lengths and pan angle between the two cameras. The calibration utilizes observations of a calibration structure with known geometry. Test results show the precision attainable is plus or minus 0.8 mm in range at 2 m distance using a camera separation of 171 mm. To demonstrate a task needed on Space Station Freedom, a target structure with a movable I beam was built. The camera head can autonomously direct actuators to dock the I-beam to another one so that they could be bolted together. Author

N90-10570*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
SELF-CALIBRATION OF ROBOT-SENSOR SYSTEM Abstract Only
PEN-SHU YEH *In* NASA. Ames Research Center, Vision Science and Technology at NASA: Results of a Workshop p 51 Aug. 1989
Avail: NTIS HC A04/MF A01 CSCL 05/8

The process of finding the coordinate transformation between a robot and an external sensor system has been addressed. This calibration is equivalent to solving a nonlinear optimization problem for the parameters that characterize the transformation. A two-step procedure is herein proposed for solving the problem. The first step involves finding a nominal solution that is a good approximation of the final solution. A varational problem is then generated to replace the original problem in the next step. With the assumption that the variational parameters are small compared to unity, the problem that can be more readily solved with relatively small computation effort. Author

N90-10571*# Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
A SIMPLE, MASS BALANCE MODEL OF CARBON FLOW IN A CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEM
JAY L. GARLAND Mar. 1989 37 p Prepared in cooperation with Bionetics Corp., Cocoa Beach, FL
(Contract NAS10-10285)
(NASA-TM-102151; NAS 1.15:102151) Avail: NTIS HC A03/MF A01 CSCL 05/8

Internal cycling of chemical elements is a fundamental aspect of a Controlled Ecological Life Support System (CELSS). Mathematical models are useful tools for evaluating fluxes and reservoirs of elements associated with potential CELSS configurations. A simple mass balance model of carbon flow in CELSS was developed based on data from the CELSS Breadboard project at Kennedy Space Center. All carbon reservoirs and fluxes were calculated based on steady state conditions and modelled using linear, donor-controlled transfer coefficients. The linear expression of photosynthetic flux was replaced with Michaelis-Menten kinetics based on dynamical analysis of the model which found that the latter produced more adequate model output. Sensitivity analysis of the model indicated that accurate determination of the maximum rate of gross primary production is critical to the development of an accurate model of carbon flow. Atmospheric carbon dioxide was particularly sensitive to changes in photosynthetic rate. The small reservoir of CO2 relative to large CO2 fluxes increases the potential for volatility in CO2 concentration. Feedback control mechanisms regulating CO2 concentration will probably be necessary in a CELSS to reduce this system instability. Author

N90-10572# Georgia Inst. of Tech., Atlanta.
ACTIVE PARTICIPATION IN HIGHLY AUTOMATED SYSTEMS: TURNING THE WRONG STUFF INTO THE RIGHT STUFF Technical Report, 1 Jun. 1986 - 30 May 1989
JACQUELINE R. IDASZAK and CHARLES L. HULIN (Illinois Univ., Urbana.) 25 Jun. 1989 50 p
(Contract N00014-86-K-0332; RR04209)
(AD-A210218; ARL-89-7/ONR-89-1) Avail: NTIS HC A03/MF A01 CSCL 05/6

A failure of human operators to take an active monitoring role in complex automated systems has resulted in operators who are less able to improve the efficiency and stability of a system and unable to make a transition from normal scanning behavior to the detection, diagnosis, and correction of system failures. Passive monitoring is common when operator training follows an associative or stimulus-response model. In this study, we manipulated operator-system participation and operator-operator communication to investigate the effects of increases in active participation on operator monitoring and problem-solving performance. A total of 112 subjects worked as operators of a simulated process system. Operators worked in teams of two on both a monitoring task and, after the system failed, a diagnostic task. The results of this study suggest that active participation in the system improves both monitoring and diagnostic performance. In addition, active participation reduces boredom during monitoring, and stress while diagnosing a failure. Communication, on the other hand, was found to be a mixed blessing. Communication tended to facilitate performance of active participants, but degraded performance of passive participants. The implications of these results for system design, operator training, and future communication studies are discussed. GRA

N90-10573# Dayton Univ., OH.
EFFECTS OF MINIATURE CRT (CATHODE RAY TUBE) LOCATION UPON PRIMARY AND SECONDARY TASK PERFORMANCES Final Report, Sep. 1988 - Apr. 1989
RONALD M. KATSUYAMA, EVAN P. ROLEK, SUZANNE JOHNSON, and DONALD L. MONK (Aerospace Medical Research Labs., Wright-Patterson AFB, OH.) May 1989 47 p
(Contract F33615-85-C-0541)
(AD-A210223; AAMRL-TR-89-018) Avail: NTIS HC A03/MF A01 CSCL 23/2

Dual task performances were investigated as a function of the location of a peripherally mounted miniature CRT which presented secondary task information. The miniature CRT's location was varied across 3 levels of elevation and 4 levels of azimuth. Primary task information was presented by means of a stationary, centrally located CRT. The primary task required continuous monitoring of the primary display, while the secondary task required continuous tracking of an object on the secondary display. In general, the results indicated that performance decrements were not only a function of the absolute size of the viewing angle formed by the primary and secondary displays, but, in addition, by its direction. For example: (1) primary task performance decrements were generally greater when upward eye shifts were required to view the secondary display than when the corresponding downward eye shifts were required; (2) secondary task performance decrements were obtained only with upward eye shifts; and (3) lateral eye shifts produced smaller primary task decrements than comparable upward eye shifts. GRA

N90-10574# Carnegie-Mellon Univ., Pittsburgh, PA. Robotics Inst.
ON LEARNING FROM EXERCISES
B. K. NATARAJAN Feb. 1989 21 p
(AD-A210593; CMU-RI-TR-89-4) Copyright Avail: NTIS HC A03/MF A01 CSCL 05/8

This paper explores a new direction in the formal theory of learning--learning in the sense of improving computational efficiency

as opposed to concept learning in the sense of Valient. Specifically, the paper concerns algorithms that learn to solve problems from sample instances of the problems. We develop a general framework for such learning and study the framework over two distinct random sources of sample instances. The first source provides sample instances together with their solutions, while the second source provides unsolved instances or exercises. We prove two theorems identifying conditions sufficient for learning over the two sources, our proofs being constructive in that they exhibit learning algorithms. To illustrate the scope of our results, we discuss their application to a program that learns to solve restricted classes of symbolic integrals. GRA

N90-11445*# Texas A&M Univ., College Station. Center for Electrochemical Systems and Hydrogen Research.
SELECTIVE REMOVAL OF ORGANICS FOR WATER RECLAMATION Semiannual Report
OLIVER J. MURPHY and G. DUNCAN HITCHENS Sep. 1989 24 p
(Contract NAG9-350)
(NASA-CR-185959; NAS 1.26:185959) Avail: NTIS HC A03/MF A01 CSCL 06/11

Electrolysis has been investigated as a means of purifying waste water. The feasibility of the direct electrochemical oxidation of urea has been demonstrated. Urea levels were reduced from 1200 ppm to 1 ppm forming the basis for a new approach to urine purification where the only consumable is electrical energy. Preliminary estimates of the energy requirements are 270 W/hr per liter of urine. Urea oxidation rates of around 350 mg urea/hr/m2 were observed. It is anticipated that a 1 m2 geometric area of electrode could treat urine for a crew of several persons. The low levels of organic contaminants resulting from this treatment indicate that the approach may have an impact as a post treatment process. Experiments are planned to investigate this later possibility. Author

N90-11446# Anacapa Sciences, Inc., Fort Rucker, AL.
TASK ANALYSIS OF THE UH-60 MISSION AND DECISION RULES FOR DEVELOPING A UH-60 WORKLOAD PREDICTION MODEL. VOLUME 1: SUMMARY REPORT Interim Report, Dec. 1986 - Dec. 1987
CARL R. BIERBAUM, SANDRA M. SZABO, and THEODORE B. ALDRICH Feb. 1989 43 p
(Contract MDA903-87-C-0523; AF PROJ. 793)
(AD-A210763; ASI90-302-87-VOL-1; ARI-RP-89-08-VOL-1) Avail: NTIS HC A03/MF A01 CSCL 05/9

A composite scenario was used to conduct a comprehensive task analysis of the UH-60 mission. The analysis used a top-down approach to identify the mission's phases, functions, and tasks. Nine phases, 34 segments, 48 functions, and 138 tasks were identified. The crewmember performing each task was identified, and estimates of the sensory, cognitive, and psychomotor workload associated with the tasks were derived. Estimates of the task times were also derived. The mission/task analysis data were used to develop a computer model of workload for UH-60 crewmembers. The model used a bottom-up approach to build mission functions from tasks and mission segments from functions. Decision rules were written to specify the procedure for combining the tasks into functions and the functions into segments. The model permitted an analysis of total workload experienced by each crewmember in the performance of both sequential and concurrent tasks. GRA

55

SPACE BIOLOGY

Includes exobiology; planetary biology; and extraterrestrial life.

A90-10234
AN OPTICAL YIELD THAT INCREASES WITH TEMPERATURE IN A PHOTOCHEMICALLY INDUCED ENANTIOMERIC ISOMERIZATION
YOSHIHISA INOUE, TAIZO YOKOYAMA, NORITSUGU YAMASAKI, and AKIRA TAI (Himeji Institute of Technology, Japan) Nature (ISSN 0028-0836), vol. 341, Sept. 21, 1989, p. 225, 226. Research supported by MOESC. refs
Copyright

A systematic study of the temperature dependence of the photosensitized enantiodifferentiating isomerization of a simple alkene is reported. It is found that above a critical temperature characteristic of the photosensitizer used the optical yield increases with increasing temperature, apparently conflicting with the widely accepted view that lower temperatures favor a higher optical yield. Thus both enantiomers may be produced with high efficiency using a single chiral source. This implies that transfer and multiplication of chirality in natural systems, an important aspect of the development of prebiotic organic molecules, may be effected more simply than has hitherto been supposed. C.D.

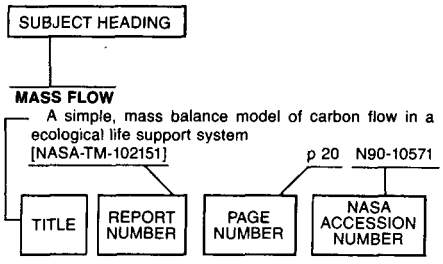
A90-10425* Katholieke Univ., Nijmegen (Netherlands).
WAS ADENINE THE FIRST PURINE?
ALAN W. SCHWARTZ and C. G. BAKKER (Nijmegen, Katholieke Universiteit, Netherlands) Science (ISSN 0036-8075), vol. 245, Sept. 8, 1989, p. 1102-1104. refs
(Contract NGR-05-067-001)
Copyright

Oligomerization of HCN (1 molar) in the presence of added formaldehyde (0.5 molar) produced an order of magnitude more 8-hydroxymethyladenine than adenine or any other biologically significant purine. This result suggests that on the prebiotic earth, nucleoside analogs may have been synthesized directly in more complex mixtures of HCN with other aldehydes. Author

A90-12246* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
IMPACTS AND THE ORIGIN OF LIFE
VERNE R. OBERBECK and GUY FOGLEMAN (NASA, Ames Research Center; Search for Extraterrestrial Intelligence Institute, Moffett Field, CA) Nature (ISSN 0028-0836), vol. 339, June 8, 1989, p. 434.
Copyright

Consideration is given to the estimate of Maher and Stevenson (1988) of the time at which life could have developed on earth through chemical evolution within a time interval between impact events, assuming chemical or prebiotic evolution times of 100,000 to 10,000,000 yrs. An error in the equations used to determine the time periods between impact events in estimating this time is noted. A revised equation is presented and used to calculate the point in time at which impact events became infrequent enough for life to form. By using this equation, the finding of Maher and Stevenson that life could have first originated between 4,100 and 4,300 million years ago is changed to 3,700 to 4,000 million years ago. R.B.

Typical Subject Index Listing



The subject heading is a key to the subject content of the document. The title is used to provide a description of the subject matter. When the title is insufficiently descriptive of document content, a title extension is added, separated from the title by three hyphens. The (NASA or AIAA) accession number and the page number are included in each entry to assist the user in locating the abstract in the abstract section. If applicable, a report number is also included as an aid in identifying the document. Under any one subject heading, the accession numbers are arranged in sequence with the AIAA accession numbers appearing first.

A

B

C

D

E

F

G

H

I

J

L

M

N

O

P

R

S

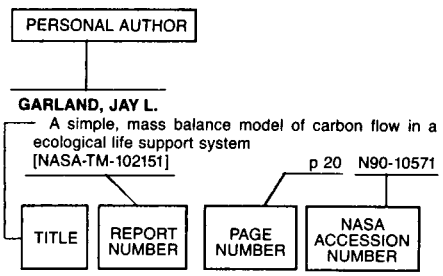
T

U

V

W

Typical Personal Author Index Listing



Listings in this index are arranged alphabetically by personal author. The title of the document provides the user with a brief description of the subject matter. The report number helps to indicate the type of document listed (e.g., NASA report, translation, NASA contractor report). The page and accession numbers are located beneath and to the right of the title. Under any one author's name the accession numbers are arranged in sequence with the AIAA accession numbers appearing first.

G

H

I

J

K

L

M

N

O

P

Q

R

S

T

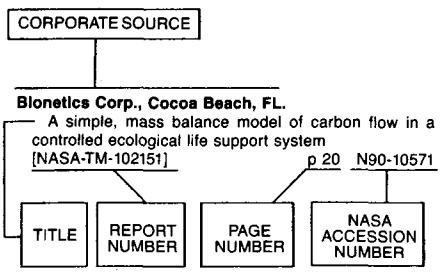
U

V

W

Y

Typical Corporate Source Index Listing



Listings in this index are arranged alphabetically by corporate source. The title of the document is used to provide a brief description of the subject matter. The page number and the accession number are included in each entry to assist the user in locating the abstract in the abstract section. If applicable, a report number is also included as an aid in identifying the document.

SOURCE

O

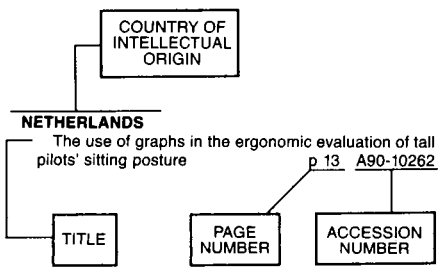
S

T

U

V

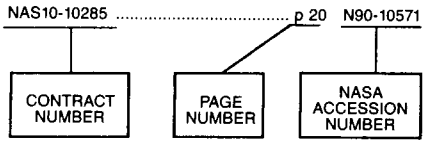
Typical Foreign Technology Index Listing



Listings in this index are arranged alphabetically by country of intellectual origin. The title of the document is used to provide a brief description of the subject matter. The page number and the accession number are included in each entry to assist the user in locating the citation in the abstract section. If applicable, a report number is also included as an aid in identifying the document.

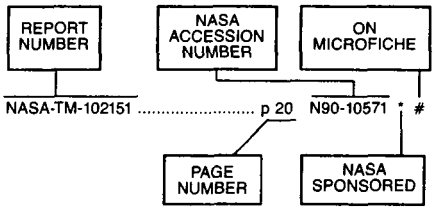
FOREIGN

Typical Contract Number Index Listing



Listings in this index are arranged alphanumerically by contract number. Under each contract number, the accession numbers denoting documents that have been produced as a result of research done under the contract are arranged in ascending order with the AIAA accession numbers appearing first. The accession number denotes the number by which the citation is identified in the abstract section. Preceding the accession number is the page number on which the citation may be found.

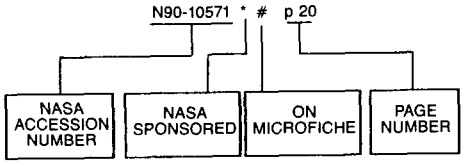
Typical Report Number Index Listing



Listings in this index are arranged alphanumerically by report number. The page number indicates the page on which the citation is located. The accession number denotes the number by which the citation is identified. An asterisk (*) indicates that the item is a NASA report. A pound sign (#) indicates that the item is available on microfiche.

ACCESSION NUMBER INDEX

Typical Accession Number Index Listing



Listings in this index are arranged alphanumerically by accession number. The page number listed to the right indicates the page on which the citation is located. An asterisk (*) indicates that the item is a NASA report. A pound sign (#) indicates that the item is available on microfiche.

AVAILABILITY OF CITED PUBLICATIONS

IAA ENTRIES (A90-10000 Series)

Publications announced in *IAA* are available from the AIAA Technical Information Service as follows: Paper copies of accessions are available at $10.00 per document (up to 50 pages), additional pages $0.25 each. Microfiche[1] of documents announced in *IAA* are available at the rate of $4.00 per microfiche on demand. Standing order microfiche are available at the rate of $1.45 per microfiche for *IAA* source documents and $1.75 per microfiche for AIAA meeting papers.

Minimum air-mail postage to foreign countries is $2.50. All foreign orders are shipped on payment of pro-forma invoices.

All inquiries and requests should be addressed to: Technical Information Service, American Institute of Aeronautics and Astronautics, 555 West 57th Street, New York, NY 10019. Please refer to the accession number when requesting publications.

STAR ENTRIES (N90-10000 Series)

One or more sources from which a document announced in *STAR* is available to the public is ordinarily given on the last line of the citation. The most commonly indicated sources and their acronyms or abbreviations are listed below. If the publication is available from a source other than those listed, the publisher and his address will be displayed on the availability line or in combination with the corporate source line.

Avail: NTIS. Sold by the National Technical Information Service. Prices for hard copy (HC) and microfiche (MF) are indicated by a price code preceded by the letters HC or MF in the *STAR* citation. Current values for the price codes are given in the tables on NTIS PRICE SCHEDULES.

Documents on microfiche are designated by a pound sign (#) following the accession number. The pound sign is used without regard to the source or quality of the microfiche.

Initially distributed microfiche under the NTIS SRIM (Selected Research in Microfiche) is available at greatly reduced unit prices. For this service and for information concerning subscription to NASA printed reports, consult the NTIS Subscription Section, Springfield, VA 22161.

NOTE ON ORDERING DOCUMENTS: When ordering NASA publications (those followed by the • symbol), use the N accession number. NASA patent applications (only the specifications are offered) should be ordered by the US-Patent-Appl-SN number. Non-NASA publications (no asterisk) should be ordered by the AD, PB, or other *report number* shown on the last line of the citation, not by the N accession number. It is also advisable to cite the title and other bibliographic identification.

Avail: SOD (or GPO). Sold by the Superintendent of Documents, U.S. Government Printing Office, in hard copy. The current price and order number are given following the availability line. (NTIS will fill microfiche requests, as indicated above, for those documents identified by a # symbol.)

(1) A microfiche is a transparent sheet of film, 105 by 148 mm in size containing as many as 60 to 98 pages of information reduced to micro images (not to exceed 26.1 reduction).

Avail: BLL (formerly NLL): British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England. Photocopies available from this organization at the price shown. (If none is given, inquiry should be addressed to the BLL.)

Avail: DOE Depository Libraries. Organizations in U.S. cities and abroad that maintain collections of Department of Energy reports, usually in microfiche form, are listed in *Energy Research Abstracts.* Services available from the DOE and its depositories are described in a booklet, *DOE Technical Information Center - Its Functions and Services* (TID-4660), which may be obtained without charge from the DOE Technical Information Center.

Avail: ESDU. Pricing information on specific data, computer programs, and details on Engineering Sciences Data Unit (ESDU) topic categories can be obtained from ESDU International Ltd. Requesters in North America should use the Virginia address while all other requesters should use the London address, both of which are on the page titled ADDRESSES OF ORGANIZATIONS.

Avail: Fachinformationszentrum, Karlsruhe. Sold by the Fachinformationszentrum Energie, Physik, Mathematik GMBH, Eggenstein Leopoldshafen, Federal Republic of Germany, at the price shown in deutschmarks (DM).

Avail: HMSO. Publications of Her Majesty's Stationery Office are sold in the U.S. by Pendragon House, Inc. (PHI), Redwood City, CA. The U.S. price (including a service and mailing charge) is given, or a conversion table may be obtained from PHI.

Avail: NASA Public Document Rooms. Documents so indicated may be examined at or purchased from the National Aeronautics and Space Administration, Public Documents Room (Room 126), 600 Independence Ave., S.W., Washington, DC 20546, or public document rooms located at each of the NASA research centers, the NASA Space Technology Laboratories, and the NASA Pasadena Office at the Jet Propulsion Laboratory.

Avail: Univ. Microfilms. Documents so indicated are dissertations selected from *Dissertation Abstracts* and are sold by University Microfilms as xerographic copy (HC) and microfilm. All requests should cite the author and the Order Number as they appear in the citation.

Avail: US Patent and Trademark Office. Sold by Commissioner of Patents and Trademarks, U.S. Patent and Trademark Office, at the standard price of $1.50 each, postage free.

Avail: (US Sales Only). These foreign documents are available to users within the United States from the National Technical Information Service (NTIS). They are available to users outside the United States through the International Nuclear Information Service (INIS) representative in their country, or by applying directly to the issuing organization.

Avail: USGS. Originals of many reports from the U.S. Geological Survey, which may contain color illustrations, or otherwise may not have the quality of illustrations preserved in the microfiche or facsimile reproduction, may be examined by the public at the libraries of the USGS field offices whose addresses are listed in this Introduction. The libraries may be queried concerning the availability of specific documents and the possible utilization of local copying services, such as color reproduction.

Avail: Issuing Activity, or Corporate Author, or no indication of availability. Inquiries as to the availability of these documents should be addressed to the organization shown in the citation as the corporate author of the document.

PUBLIC COLLECTIONS OF NASA DOCUMENTS

DOMESTIC: NASA and NASA-sponsored documents and a large number of aerospace publications are available to the public for reference purposes at the library maintained by the American Institute of Aeronautics and Astronautics, Technical Information Service, 555 West 57th Street, 12th Floor, New York, NY 10019.

EUROPEAN: An extensive collection of NASA and NASA-sponsored publications is maintained by the British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England for public access. The British Library Lending Division also has available many of the non-NASA publications cited in *STAR*. European requesters may purchase facsimile copy or microfiche of NASA and NASA-sponsored documents, those identified by both the symbols # and • from ESA – Information Retrieval Service European Space Agency, 8-10 rue Mario-Nikis, 75738 CEDEX 15, France.

FEDERAL DEPOSITORY LIBRARY PROGRAM

In order to provide the general public with greater access to U.S. Government publications, Congress established the Federal Depository Library Program under the Government Printing Office (GPO), with 51 regional depositories responsible for permanent retention of material, inter-library loan, and reference services. At least one copy of nearly every NASA and NASA-sponsored publication, either in printed or microfiche format, is received and retained by the 51 regional depositories. A list of the regional GPO libraries, arranged alphabetically by state, appears on the inside back cover. These libraries are *not* sales outlets. A local library can contact a Regional Depository to help locate specific reports, or direct contact may be made by an individual.

STANDING ORDER SUBSCRIPTIONS

NASA SP-7011 and its supplements are available from the National Technical Information Service (NTIS) on standing order subscription as PB90-912300 at the price of $11.50 domestic and $23.00 foreign, and at $19.50 domestic and $39.00 foreign for the annual index. Standing order subscriptions do not terminate at the end of a year, as do regular subscriptions, but continue indefinitely unless specifically terminated by the subscriber. Questions on the availability of the predecessor publications, *Aerospace Medicine and Biology* (Volumes I-XI), should be directed to NTIS.

ADDRESSES OF ORGANIZATIONS

American Institute of Aeronautics and Astronautics
Technical Information Service
555 West 57th Street, 12th Floor
New York, New York 10019

British Library Lending Division,
Boston Spa, Wetherby, Yorkshire,
England

Commissioner of Patents and Trademarks
U.S. Patent and Trademark Office
Washington, DC 20231

Department of Energy
Technical Information Center
P.O. Box 62
Oak Ridge, Tennessee 37830

European Space Agency-Information Retrieval Service
ESRIN
Via Galileo Galilei
00044 Frascati (Rome) Italy

Engineering Sciences Data Unit International
P.O. Box 1633
Manassas, Virginia 22110

Engineering Sciences Data Unit International, Ltd.
251-259 Regent Street
London, W1R 7AD, England

Fachinformationszentrum Energie, Physik, Mathematik
GMBH
7514 Eggenstein Leopoldshafen
Federal Republic of Germany

Her Majesty's Stationery Office
P.O. Box 569, S.E. 1
London, England

NASA Scientific and Technical Information Facility
P.O. Box 8757
BWI Airport, Maryland 21240

National Aeronautics and Space Administration
Scientific and Technical Information Division (NTT)
Washington, DC 20546

National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22161

Pendragon House, Inc.
899 Broadway Avenue
Redwood City, California 94063

Superintendent of Documents
U.S. Government Printing Office
Washington, DC 20402

University Microfilms
A Xerox Company
300 North Zeeb Road
Ann Arbor, Michigan 48106

University Microfilms, Ltd.
Tylers Green
London, England

U.S. Geological Survey Library National Center
MS 950
12201 Sunrise Valley Drive
Reston, Virginia 22092

U.S. Geological Survey Library
2255 North Gemini Drive
Flagstaff, Arizona 86001

U.S. Geological Survey
345 Middlefield Road
Menlo Park, California 94025

U.S. Geological Survey Library
Box 25046
Denver Federal Center, MS914
Denver, Colorado 80225

NTIS PRICE SCHEDULES

(Effective January 1, 1990)

Schedule A
STANDARD PRICE DOCUMENTS AND MICROFICHE

PRICE CODE	NORTH AMERICAN PRICE	FOREIGN PRICE
A01	$ 8.00	$ 16.00
A02	11.00	22.00
A03	15.00	30.00
A04-A05	17.00	34.00
A06-A09	23.00	46.00
A10-A13	31.00	62.00
A14-A17	39.00	78.00
A18-A21	45.00	90.00
A22-A25	53.00	106.00
A99	*	*
N01	60.00	120.00
N02	59.00	118.00
N03	20.00	40.00

Schedule E
EXCEPTION PRICE DOCUMENTS AND MICROFICHE

PRICE CODE	NORTH AMERICAN PRICE	FOREIGN PRICE
E01	$10.00	$ 20.00
E02	12.00	24.00
E03	14.00	28.00
E04	16.50	33.00
E05	18.50	37.00
E06	21.50	43.00
E07	24.00	48.00
E08	27.00	54.00
E09	29.50	59.00
E10	32.50	65.00
E11	35.00	70.00
E12	38.50	77.00
E13	41.00	82.00
E14	45.00	90.00
E15	48.50	97.00
E16	53.00	106.00
E17	57.50	115.00
E18	62.00	124.00
E19	69.00	138.00
E20	80.00	160.00
E99	*	*

* Contact NTIS for price quote.

IMPORTANT NOTICE

NTIS Shipping and Handling Charges

U.S., Canada, Mexico — ADD $3.00 per TOTAL ORDER

All Other Countries — ADD $4.00 per TOTAL ORDER

Exceptions — Does NOT apply to:

ORDERS REQUESTING NTIS RUSH HANDLING

ORDERS FOR SUBSCRIPTION OR STANDING ORDER PRODUCTS *ONLY*

NOTE: Each additional delivery address on an order requires a separate shipping and handling charge.

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
NASA SP-7011(333)		

4. Title and Subtitle	5. Report Date
Aerospace Medicine and Biology A Continuing Bibliography (Supplement 333)	February 1990
	6. Performing Organization Code
7. Author(s)	8. Performing Organization Report No.
	10. Work Unit No.
9. Performing Organization Name and Address National Aeronautics and Space Administration Washington, DC 20546	11. Contract or Grant No.
	13. Type of Report and Period Covered
12. Sponsoring Agency Name and Address	14. Sponsoring Agency Code

15. Supplementary Notes

16. Abstract

This bibliography lists 122 reports, articles and other documents introduced into the NASA scientific and technical information system in January 1990.

17. Key Words (Suggested by Authors(s))	18. Distribution Statement
Aerospace Medicine Bibliographies Biological Effects	Unclassified - Unlimited

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price *
Unclassified	Unclassified	56	A04/HC

*For sale by the National Technical Information Service, Springfield, Virginia 22161

NASA-Langley, 1990